(FIRST REVISION)
CHANGES 1 and 2 entered

11.75 ROCKET AMMUNITION

DESCRIPTION AND INSTRUCTIONS FOR USE

A BUREAU OF ORDNANCE PUBLICATION 13 MARCH 1945

CONFIDENTIAL

BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

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Approved by The Chief of The Bureau of Ordnance

J. Wenter
Acting Chief of Bureau

OP 1227 (First Revision) CHANGE 2

5 June 1945

1 Page ——— Page 1

ORDNANCE PAMPHLET 1227 (First Revision) is changed as follows:

11.75 Rocket Ammunition

Delete entire Chapter XV. (This chapter covers Combat Radius. Deletion is made because the combat radii of service aircraft, when loaded with 11.75 Aircraft Rockets, are promulgated by the Bureau of Aeronautics.)

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M. R. Kelley
Acting

OP 1227 (1st Rev.) CHANGE 1

17 May 1945

2 Pages ——— Page 1

ORDNANCE PAMPHLET 1227 (1st Rev.) is changed as follows:

11.75 ROCKET AMMUNITION (FIRST REVISION)

Add after paragraph 17, page 17;

18. The assembled rocket can be hoisted from the assembly jig to a truck using a Bomb Carrier Mk 4 to attach the hoisting hook to the rocket. A Bomb and Torpedo Truck Mk 5 Mod 2 is suitable for moving the assembled rocket to the aircraft aboard ship. A Bomb Trailer Mk 2 Mod 1 or 2 is most satisfactory at shore based units for moving the assembled rocket.

19. Bomb Skids Mk 1 Mod 1 can be used in place of the assembly jig in assembling the Rocket Heads Mk 1 Mod 1, Mk 2 Mod 0, or Mk 3 and Mods with the motor. When using this method of assembly the equipment required is as follows:

(a) Two Bomb Skids Mk 1 Mod 1.
(b) Crane, Bomb Service Truck, or other hoisting equipment
(c) Bomb Carrier Mk 4
(d) Two Strap Wrenches (for 11.75-inch Rocket) Mk 1 Mod 0
(e) End Wrenches
(f) Socket Wrench 9/16-inch
(g) Screwdriver

The Assembly Kit (for 11.75-inch Rocket) Mk 3 Mod 0 will provide items (d) through (g) of the assembly equipment required.

20. The assembly procedure, when the rocket head and motor are removed to the assembly room on Bomb Skids Mk 1 Mod 1, is as follows:

(a) Remove the motor handling band. This band is now provided with a side hinge and bolts which facilitate removal while the motor is on the Bomb Skid Mk 1 Mod 1. For a motor equipped with an older type band having tightening bolts at the bottom, the band can be removed after assembly of the head and motor by lifting the round from the skid and slipping the band back over the motor tube before the tail fin assembly is put on. For motors so equipped, also remove the forward launching band which has two sets of lugs.

(b) Remove the cap from the nozzle plate and the front shipping plug and its gasket from the motor tube.

(c) Remove the handling band from the head. If the head is so positioned on the Bomb Skid Mk 1 Mod 1 that the handling band cannot be easily removed, it can be opened to permit turning the head.

(d) Remove the shipping cap or protecting cuff from the head.

(e) Check to see that the base fuze is in place and that the inlet cup and screen on the fuze are undamaged and clean.

(f) Check to see that the head and motor threads are clean and then oil or coat them with grease. Threads of large size are likely to gall if not well lubricated.

(g) After aligning the motor and head threads for engagement by rotating the head, bring the two skids together by rolling on a fairly level surface. Screw the head into the motor using the strap wrenches. In case of binding, the head should be unscrewed and the threads inspected because large diameter threads cannot be forced. The end of the motor tube must seat firmly on the shoulder of the head.

(h) Hoist the rocket from the two skids and place on a truck or trailer as described in paragraph 18 above.

(i) Assemble the tail fin assembly to the motor in accordance with the instructions for installation on page 16, paragraph 6. Check that the suspension bands are tight. An 8 or 10-inch wrench should be used to tighten. If a torque wrench is available, tighten to 40 foot-pounds torque.

(j) Send the assembled round to the loading crew with lanyard and firing cable.

Add after Page 19:

Pages 19a and 19b containing Figures 15(A), 15(B), 15(C) and 15(D).

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11.75 ROCKET AMMUNITION

DESCRIPTION AND INSTRUCTIONS FOR USE

13 MARCH 1945

NAVY DEPARTMENT

BUREAU OF ORDNANCE

WASHINGTON 25, D. C.

13 March 1945

CONFIDENTIAL

Ordnance Pamphlet 1227 (First Edition)

11.75-INCH ROCKET AMMUNITION—Description and Instructions for Use

1. Ordnance Pamphlet 1227 (First Revision) describes the 11.75-inch aircraft rocket, and contains instructions for its assembling and loading.

2. This publication is for the use of all personnel concerned with the operation and handling of 11.75-inch aircraft rockets. The material in Chapters IX, X, XI, XII, and XV is under the cognizance of the Bureau of Aeronautics, and is included herein for the convenience of operating personnel. The information in those chapters is considered correct as of 27 January 1945. Changes will be issued, as received, separate from changes on the ammunition chapters.

3. Because of the rapid succession of design changes, this pamphlet will again be revised as soon as practicable.

4. This publication supersedes Ordnance Pamphlet 1227 (Preliminary), which should be destroyed by burning.

5. This publication is CONFIDENTIAL and shall be safeguarded in accordance with the security provisions of U. S. Navy Regulations, 1920, Article 76.

G. F. Hussey, Jr.

G. F. HUSSEY, JR.
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnance

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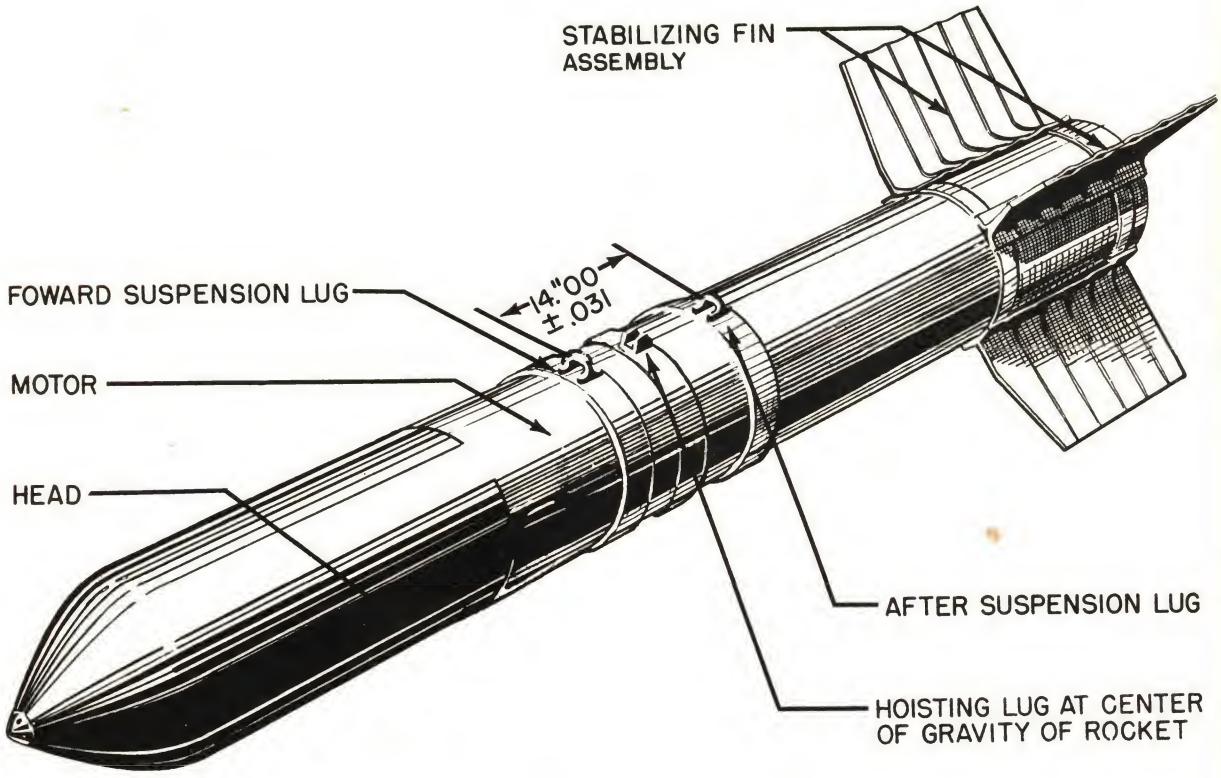


Figure 1—11.75-inch Aircraft Rocket

I—GENERAL

1. The penetrative effect and relatively high accuracy which can be obtained with the 11.75-inch Aircraft Rocket make it suitable for firing from aircraft against shipping and shore objectives, such as coastal defense guns, concrete and composite pill boxes, fuel oil storage facilities, and fortifications in general.

2. The assembled rocket is composed of three parts: (1) The 11.75-inch Rocket Head Mk 1 Mod 1 or Mk 2 Mod 0; (2) The 11.75-inch Rocket Motor Mk 1 Mods 0, 1, 2, or 3; (3) The tail fin assembly for the motors. The total weight of the round is 1,280 pounds when assembled with the 11.75-inch Rocket Motor Mk 1 Mods 0 or 1, and is 1,255 pounds when assembled with the 11.75-inch Rocket Motor Mk 1 Mods 2 or 3.

3. The rocket reaches a maximum velocity at the completion of the burning of the propellant and then is in free flight. The burning time of the propellant decreases as the motor temperature increases and is 0.88 second at 70°F. At this temperature, the maximum velocity attained by the rocket relative to the aircraft is 810 feet per second. This velocity decreases as the temperature of the motor is increased or decreased from 70°F.

II—THE 11.75-INCH ROCKET MOTOR

1. The 11.75-inch Rocket Motor is made up of a steel tube, 11.75-inch outside diameter, and 0.40-inch wall thickness. Twenty-five (25) nozzles are machined integrally in the nozzle plate which is screwed into the after end of the motor tube. The motor tube contains four Propellant Grains, Mk 19 Mod 0 of solventless extruded ballistite of cruciform cross-section 4.22-inch diameter, 1.5-inch web, and approximately 59.75 inches long. The propellant grains are inhibited on the ends and a portion of the longitudinal surfaces. The total weight of the four inhibited ballistite grains is 150 pounds. The grains are shielded from each other and supported by a partition which extends longitudinally for almost the full length of the motor tube. The grains and the partition are supported by the grid which is bolted to the nozzle plate to make the whole assembly rigid.

2. The grains burn on the uninhibited surfaces, and the amount of pressure developed (1,000 to 2,500 lbs./in.^{2}) in the motor tube depends upon the initial temperature of the propellant grains. The gases are expelled through the nozzles at a high velocity, imparting an equal and opposite momentum to the rocket. The propulsion does not depend on any interaction between the blast and surroundings; thus no recoil problem exists. It is this feature which allows the firing of large caliber rockets from aircraft.

3. In normal operation the gases from the burning powder do not pass through the large central nozzle which is closed by a copper shear disc (blow-out disc). Only when the pressure in the motor exceeds approximately 2,000 lbs./in.^{2} is this disc expelled, bringing the central nozzle into operation. The use of a shear disc allows the rocket motor to perform satisfactorily over a greater temperature range. It has one disadvantage, however, in that at motor temperatures of about 100°F., where the normal operating pressure is just about enough to shear the disc, it is impossible to predict whether the disc will blow out or not. If it blows out, the burning time is lengthened and the gravity drop is increased so that, if a sight is set assuming a shorter burning time, the rocket may miss the target.

4. The black powder charge of about 0.5 pound, contained in the metal-case Igniter Mk 19 Mod 0 at the front end of the grains, provides the ignition for the propellant. This charge is set off by two small electric squibs which are wired in parallel and which are connected to receptacles in the nozzle plate. For shipment, the receptacles are closed by protective shorting plugs which should not be removed until the electrical connectors are ready for plugging into the receptacles. The burning of the propellant is markedly affected by its moisture content; consequently, the motors are sealed at both ends. Each of the 24 peripheral nozzles is sealed with a thin metal cup cemented in place with

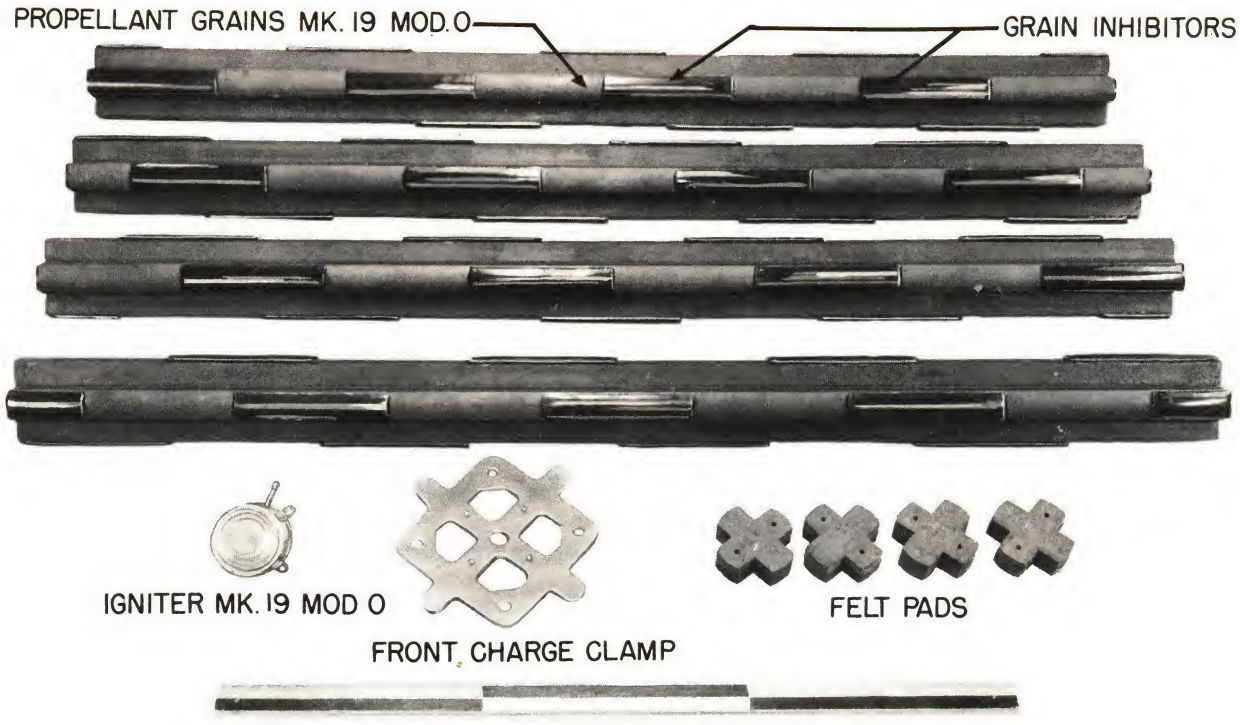


Figure 2—Motor Loading Components

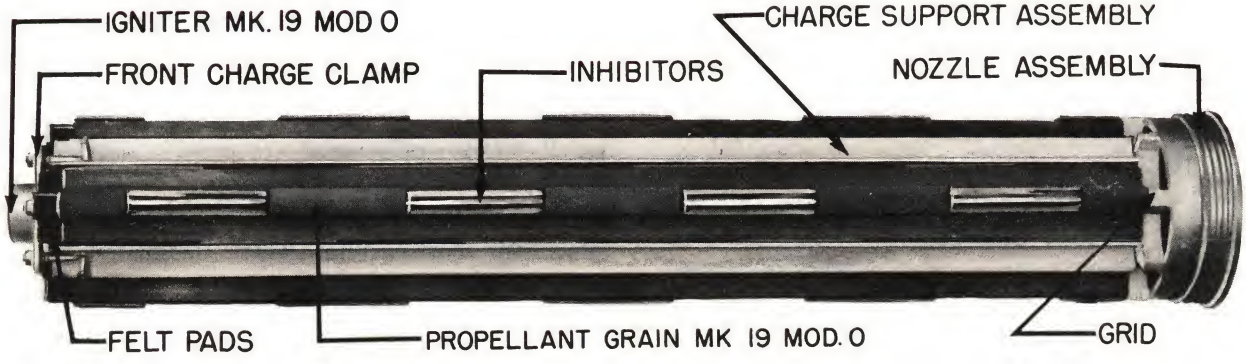


Figure 3—Internal Motor Assembly

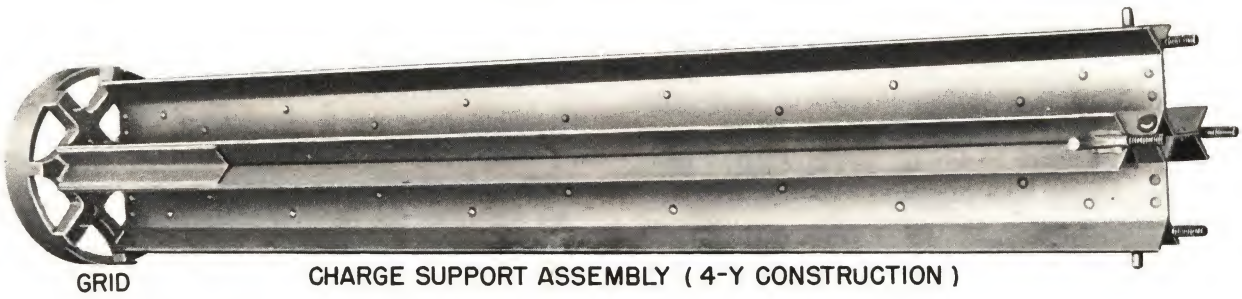


Figure 4—Grid and Charge Support Assembly

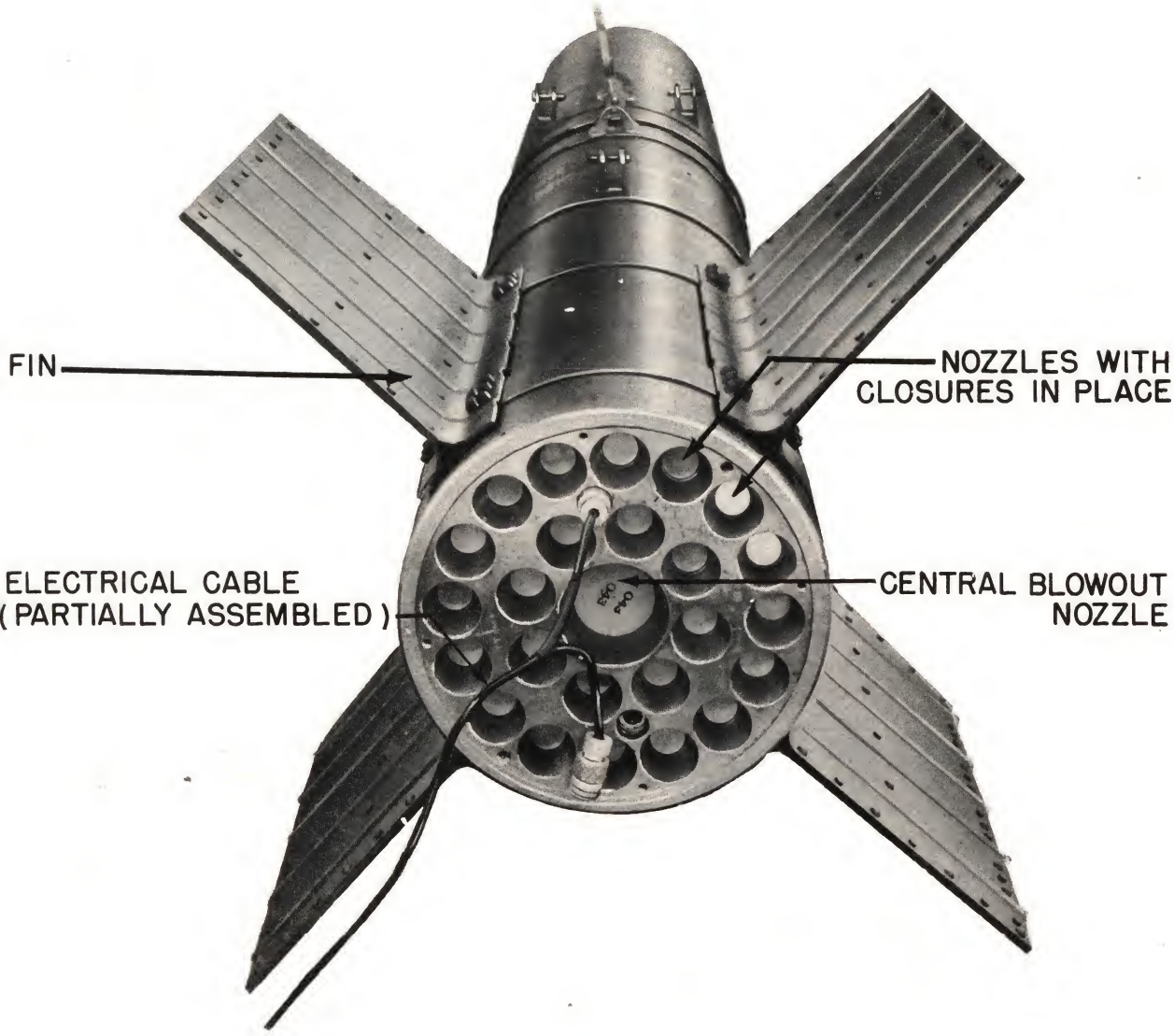


Figure 5—After End 11.75-inch Aircraft Rocket

glyptal. The front end is sealed with a thin steel disc having in its center a small "blow-out window." All these closures are to remain sealed and are not to be removed.

5. The temperature range in which it is safe to fire the motor is stenciled on the motor tube. Motors must never be fired above this rated temperature because high pressures resulting from firing the rocket, when above the rated temperature, may burst the motor. The initial issue of Bureau Motors has a temp. range of 0°–120° F.

6. The motors were originally equipped with five (5) lug bands. Two (2) bands had special launching lugs to fit the arms of the displacement launcher. Since this launcher has been replaced by the drop launcher, the front launching band may be removed from all units, so equipped, on hand at loading depots. The rear launching band on such units should be retained for use in handling the motor, and removed after the round is assembled. On motors of later production there will be a motor handling band which also will be suitable for engagement with the Carrier Mk 17 Mod 0.

7. Two (2) suspension bands with standard bomb lugs are located 14 inches apart for attaching the round to the Navy Bomb Rack Mk 51 Mod 7 or Bomb Shackle AN–B10. A hoisting band is located near the center of gravity of the round. For rounds without a hoisting hook attached to the hoisting band, a Bomb Carrier Mk 4 can be used for handling after assembly.

8. Four modifications of the 11.75-inch Rocket Motor Mk 1 have been issued for service use as follows:

Mod	*Length of Motor Tube*	*Type of Production*
0	82.0-inch	Pilot production for BuOrd by CalTech
1	82.0-inch	Regular
2	75.75-inch	Pilot production for BuOrd by CalTech
3	75.75-inch	Regular

Production of motors Mods 2 and 3 has been necessitated because the rounds with the Rocket Motor Mk 1 Mod 0 or 1 are too long to fit in the bomb elevators of CV's. Motors Mods 2 and 3, which are 6.25 inches shorter in length, weigh 25 pounds less than motors Mods 0 and 1. Except for the decreased length of the motor tubes, all the remaining components (including the grains) of the shorter motors are identical to the longer motors. This decrease in length of the motor tubes does not affect the exterior ballistics of the rounds.

9. The Electric Connector Mk 8 Mod 0, which carries the current for firing the round, has fittings on one end that plug into the airplane, and fittings on the other end that screw into the nozzle plate receptacles of the rocket motor. This connector is

Figure 6—Fin Assembly

16 ft. long. For use with the drop launcher, the Electrical Connector Mk 6 Mod 0, which is only 5 feet long, cannot be used.

10. The fins are aluminum, 10 inches by 24 inches and are attached to two bands which are clamped around the motor. Fins are shipped secured to the bands and this assembly is clamped to the motor tube when the round is assembled.

III—THE 11.75-INCH ROCKET HEAD MK 1 MOD 0

1. The 11.75-inch Rocket Head Mk 1 Mod 0 consists of a standard 500 pound SAP Bomb AN–M58A1, modified to suit this special application. This head weighs 590 pounds and contains 152.5 pounds of TNT. A modification of the standard SAP Bomb body consists of the following:

(a) All bomb body suspension lugs have been removed.

(b) Threads in the tail end of the head have been increased in length to improve the security of attachment of the base plug, and to accommodate the special design of base plug used with the modified bomb body.

(c) A special design of base plug as noted above is utilized. The new base plug accommodates the Base Fuze Mk 157 Mod 1 and two (2) auxiliary boosters Mk 2 Mod 0. The boosters are contained in a metal fuze seat liner which is attached to the forward face of the base plug.

(d) A forged steel adapter ring is welded to the after end of the bomb body. This ring is threaded on its outer surface to receive the rocket motor. Located around the circumference in front of the threaded portion of the adapter ring are four (4) holes, ½ inch in diameter, for a spanner wrench or similar tool which may be used to rotate the head while turning it into the rocket motor. A strap wrench for rotating the head is now furnished with the assembly tools.

2. The heads are shipped loaded and fuzed. The two (2) Auxiliary Boosters Mk 2 Mod 0 are inserted at loading depot at the time the heads are fuzed. In order to protect the threads on the outer surface of the adapter ring, and also to protect the Base Fuze Mk 157 Mod 1 from dirt and damage, a protecting cuff and a shipping cover are secured to the after end of each body. The cuff consists of a metal-sheaved wooden ring surrounding the adapter ring threads and the adjacent machined surfaces. The shipping cover is a circular metal plate 11.75 inches in diameter and 0.25 inch thick, which is secured to the after end of the adapter ring by means of six machine screws. This cover is removed by unscrewing the six machine screws and then the cuff can be slid off the rear end of the adapter ring. A removable handling band strapped to the head facilitates handling. This band should be removed prior to installing the assembled round on the aircraft.

3. The 11.75-inch Rocket Head Mk 1 Mod 1 is the same as described above, except that it carries the gas-checked Base Fuze Mk 157 Mod 2.

IV—11.75-INCH ROCKET HEAD MK 2 MOD 0

1. The regular service-issue head is the 11.75-inch Rocket Head Mk 2 Mod 0 which weighs 590 pounds and contains 148.5 pounds of TNT. This is a common-type head fuzed with three (3) Base Fuzes Mk 157 Mod 2, with projectile-type gas check rings. Each fuze has one auxiliary booster Mk 1 Mod 0. The threads for the motor are machined directly on the body wall. The threads in the base fuzes are protected during shipment by a one-piece shipping cap which screws on the after end of the head. This head (without shipping cap) is 50 inches long.

2. The head is equipped with a handling band. Some production units will have the hoisting hook on this band replaced by a hoisting chain. On the later production heads, this handling band will be replaced by a similar band except for the hoisting lugs, which will be suitable for engagement with the Carrier Mk 17 Mod 0. The head handling band should be removed when assembling the round.

V—BASE FUZE MK 157 MOD 2

1. The Base Fuze Mk 157 Mod 2 is a delay base-detonating fuze. It is essentially the Base Fuze Mk 157 Mod 0 in which material for the fuze body has been changed for increased strength, and the number of threads between the fuze and the fuze adapter has been approximately doubled. Provisions have also been made so that a projectile-type gas check ring can be used to seal the motor gases from the explosive filler. The fuze weighs approximately 3 pounds.

2. *Functioning mechanism:* The mechanism is contained in the fuze body, which is made up of the head and the body. The head contains a gas chamber formed by the plug and the diaphragm. Gases from the rocket motor are permitted to flow slowly into the gas chamber, through an aperture in the inlet screw, after first being filtered by the inlet screen. Immediately beneath the diaphragm, and in the body, an aluminum arming plunger is held in position by a shear wire. The arming plunger holds a locking ball in such position as to lock the firing pin body and firing pin in a forward position, compressing a weak anti-creep spring (firing pin spring). While in the forward position,

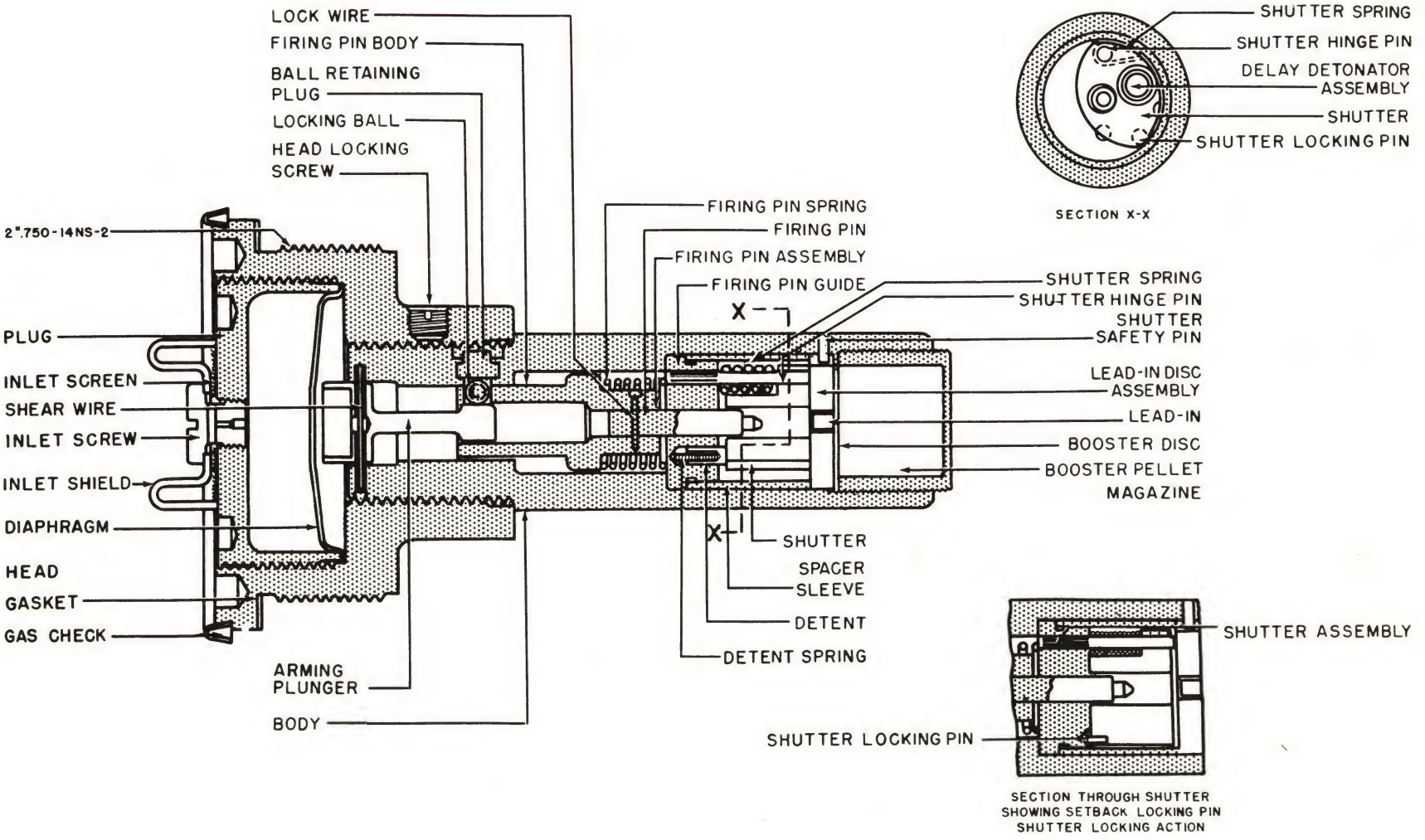


Figure 7—Fuze Mk 157 Mod 2

the firing pin extends through the firing pin guide, holding a spring-loaded shutter in an unarmed position, so that the delay detonator is out of alignment with the lead-in and the firing pin itself. A lead-in disc is housed between the shutter and the magazine which encloses the fuze cavity.

3. The explosive components are:

(a) Delay detonator—housed in shutter.

(b) Lead-in—housed in lead-in disc.

(c) Booster—approximately 12 grams (.42 ounce) tetryl—housed in magazine.

4. The fuze head screws into the base of the rocket head. The projectile-type gas check and a rubber gasket make a gas-tight seal in the body between the rocket motor and the interior of the rocket head. The rear end of the fuze (the exterior surface of the plug) is exposed to the front end of the rocket motor. The fuze body extends into a cavity in the fuze seat liner in the interior of the rocket head. The fuze arms in two stages:

(a) Through a small orifice in the inlet screw, gases from the rocket motor enter the pressure chamber in the head of the fuze. Debris from the rocket motor is filtered out by the inlet screen. When the pressure in the chamber has reached a value of approximately 300 p.s.i., which is delayed by the small orifice in the inlet screw until approximately half the burning time is consumed, the diaphragm collapses, forcing the arming plunger down and shearing the shear wire which holds the plunger in place. Movement of the plunger releases the locking ball, which, in the unarmed condition, locks the firing pin body in place, and allows the latter to move toward the rear under the force of the firing pin spring and the inertia of the firing pin body due to acceleration. The firing pin, attached to the firing pin body by a lock wire, is thus withdrawn from the delay-detonator shutter which it normally locks in the safe position.

(b) When the rocket accelerates, the inertia of the shutter forces it back against the firing pin guide, compressing the shutter spring and engaging the shutter locking pin in a hole in the firing pin guide. About midway during acceleration, the firing pin is withdrawn from the shutter, but the shutter, held by the shutter locking pin, remains locked in the safe position. When acceleration is over, the shutter spring forces the shutter forward against the lead-in disc, disengaging the shutter-locking pin from the hole in the firing-pin guide. The shutter spring then swings the shutter into the armed position (delay detonator in line with the firing pin and the lead-in), where it is locked by the detent.

5. The fuze fires by inertia of the firing-pin body driving the firing pin forward against the delay detonator on impact. After striking the primer in the delay detonator, the firing pin telescopes back into the firing-pin body, shearing the lock wire. The fuze has a fixed pyrotechnic delay of 0.02 second, in addition to which there is a slight delay in firing, inherent in the forward motion of the firing-pin body and firing pin on impact. The delay detonator initiates the tetryl lead-in and tetryl booster. This action directly detonates the auxiliary booster beneath the fuze and the main filler of the rocket.

6. The safety features of the fuze are:

(a) This fuze is detonator safe. In the unarmed position, the detonator is out of alignment with the explosive train. Should the detonator function prematurely, the force of the detonator will be dissipated upward through a hole in the firing-pin guide and away from the explosive components.

(b) Due to the delay in admission of gas from the rocket motor to the pressure chamber, the first stage in arming does not occur instantaneously after ignition of the motor. Total arming is not accomplished until acceleration has ceased. The burning distance, and therefore the arming distance, will vary with the temperature.

(c) The lightweight aluminum arming plunger and the shear wire make the fuze in a full weight projectile safe from arming by accidental dropping from heights up to at least 40 feet.

7. The fuze is shipped installed in the base of the 11.75-inch rocket head. No safety wire is needed and no preparations are required to ready the fuze for use. In this respect, this fuze is comparable to a projectile base fuze. The shipping cover over the base of the head protects the exposed end of the fuze. This cover should be kept in place until the round is to be assembled, and should be promptly replaced if the round is disassembled. Before assembling the rocket motor onto the rocket head, check that the fuze is tight in place in the base of the head, and that the fuze inlet screen has not become dirty so as to clog the orifice.

8. In disposal of the head, in case of a motor failure or firing which does not result in a detonation, extreme care should be exercised. The fuze should be removed from an unexploded head only by qualified bomb disposal personnel. There is no way to determine by examination whether or not the fuze is armed. If it is armed, the fuze will fire if the head is dropped on its nose or jarred so as to permit the firing pin to strike the primer in the delay detonator.

9. The following servicing precautions should be observed:

(a) No lubricants or preservatives of any kind may be used on this fuze.

(b) No disassembly of this fuze is authorized.

(c) Reports of malfunctioning or any difficulties encountered with this fuze should be reported to the Bureau of Ordnance. The report should contain the lot number and other markings of the fuze, and a complete detailed history of its failure to function.

10. Fuzes will be shipped assembled with the rocket heads and protected by a shipping cover which is secured to the adapter ring by machine screws. The fuze is stamped with Mark, Mod and Lot Number, the date of loading, and the loading activity.

VI—PHYSICAL CHARACTERISTICS AND PERFORMANCE DATA

1. The performance of this rocket against steel plate or reinforced concrete comparable to that used in fortifications has not been determined. As a rough estimate, it is expected that the round will penetrate a 3 to 4 foot wall of reinforced concrete of 5,000 lbs./in.^{2} test strength at zero degrees obliquity. This is based on the performance of the 500 pound SAP Bomb (AN–58A1) which was modified to make the head of the 11.75-inch rocket. Penetration assumes a 1,300 foot per second terminal velocity.

2. The 11.75-inch Aircraft Rocket has no significant underwater travel because the Base Fuze Mk 157 Mods 1 or 2 functions on water impact with the normal delay time of 0.02 second; this allows an underwater travel of about 20 feet. Tests indicate that somewhat longer time delay occurs when the round enters the water at angles less than 15 degrees. The longest observed underwater travel between impact and detonation was 80 feet for a round entering the water at a 5 degree angle. In view of this fact, it is important that pilots should aim for direct hits on above-surface parts of seaborne targets.

3. A slant range of 4,000 yards is now regarded as the limit from which accurate firing may be conducted with the 11.75-inch rocket, and greater accuracy will, of course, be obtained by release from 1,500 to 1,000 yards. Initial training is being given at dive angles 15°, 30°, and 45° to provide low, intermediate, and high angle dives adaptable to any tactical situation which is likely to be met.

TABLE I

PERFORMANCE DATA
11.75-INCH AIRCRAFT ROCKET

Temperature (°F)	0	40	70	100
Maximum Motor Pressure (lb/in.^{2})	1270	1560	1800	2070
Burning time (sec)	1.26	1.03	.88	.75
Burning distance (yd) (for plane velocity of 300 knots)	163	137	119	101
Velocity at end of burning relative to airplane (ft/sec):				
Plane velocity = 0 knots	790	810	815	810
Plane velocity = 300 knots	780	800	810	805
Dispersion (plane vel. = 250 — 300 knots)		5 mils		

TABLE II

11.75-INCH ROCKET HEAD MARK 1 MOD 0

Metal parts of head	432.0	lbs.
Filling, TNT	152.5	
Wax Pad	1.5	
Base fuze Mk 157 Mod 1 (1)	3.5	
Auxiliary booster (2-Mk 2 Mod 0)	0.5	
Loaded Weight (as fired)	590.0	lbs.
Shipping cover	11.5	lbs.
Handling band	5.0	
Total Weight as Shipped	607.0	lbs.

TABLE III

11.75-INCH ROCKET HEAD MARK 2 MOD 0

Metal parts of head	428.0	lbs.
Filling, TNT	148.5	
Wax Pad	1.5	
Base fuze Mk 157 Mod 2 (3)	10.5	
Auxiliary booster (3-Mk 1 Mod 0)	1.5	
Loaded Weight (as fired)	590.0	lbs.
Shipping cap	31.0	lbs.
Handling band	5.0	
Total Weight as Shipped	626.0	lbs.

TABLE IV

WEIGHTS AND DIMENSIONS OF 11.75-INCH AIRCRAFT ROCKET WITH MOTOR MARK 1 MOD 1 AND HEAD MARK 1 MOD 0

Part	Description	Weight (lbs.)	Size (in.) O.D.	Size (in.) Length
Head Mark 1 Mod 0		590	11.75-inch	47¼
Motor Inert Parts		504	11.75-inch	82⅜
Fins		35		
Assembled Rocket (without propellant)		1129		
Propellant Grains (4) Mark 19 Mod 0		150	(inhibited)	
Igniter		1		
Total Loaded Weight		1280		
Overall Length				123¼

TABLE V

WEIGHTS AND DIMENSIONS OF 11.75-INCH AIRCRAFT ROCKET WITH MOTOR MARK 1 MOD 1 AND HEAD MARK 2 MOD 0

Part	Description	Weight (lbs.)	Size (in.) O.D.	Size (in.) Length
Head Mark 2 Mod 0		590	11.75-inch	49¼
Motor Inert Parts		504	11.75-inch	82⅜
Fins		35		
Assembled Rocket (without propellant)		1129		
Propellant Grains (4) Mark 19 Mod 0		150	(inhibited)	
Igniter		1		
Total Loaded Weight		1280		
Overall Length				125¼

TABLE VI

WEIGHTS AND DIMENSIONS OF 11.75-INCH AIRCRAFT ROCKET WITH MOTOR MARK 1 MOD 3 (SHORTENED MOTOR) AND HEAD MARK 2 MOD 0

Part	Description	Weight (lbs.)	Size (in.) O.D.	Size (in.) Length
Head Mark 2 Mod 0		590	11.75-inch	49¼
Motor Inert Parts		479	11.75-inch	76⅛
Fins		35		
Assembled Rocket (without propellant)		1104		
Propellant Grains (4) Mark 19 Mod 0		150	(inhibited)	
Igniter		1		
Total Loaded Weight		1255		
Overall Length				119

TABLE VII

BALLISTIC CONSTANTS OF 11.75-INCH ROCKET WITH MOTOR MARK 1 MOD 1 AND HEAD MARK 1 MOD 0 (No information available for Head Mark 2 Mod 0 at this time)

Distance from CG to LEF (in.)	38.8
Distance from Nozzle Throat to CG (in.)	61.7
Yaw Oscillation Distance (ft.)	610
Deceleration Coefficient (ft.-1)	1.6 x 10-5 at 1200 f/s 0.9 x 10-5 at 800 f/s
Radii of gyration:	
About transverse axis	3.1 ft.
About longitudinal axis	0.40 ft.

CG..... Center of gravity
LEF..... Leading edge of fins

VII—ASSEMBLY KIT MK 1 MOD 0

1. Because of the difficulties encountered in starting large diameter threads and due to the weight of the head and motor, the Assembly Jig Mk 1 Mod 0 is provided. This Assembly Jig and the other necessary tools make up the Assembly Kit Mk 1 Mod 0 as follows:

(a) Assembly Jig Mk 1 Mod 0.
(b) Spanner Wrench Mk 4 Mod 0.
(c) Strap Wrench Mk 1 Mod 0.
(d) Ratchet Wrench, 9/16" socket.
(e) End Wrench, 9/16".
(f) Soft Mallet.

2. The Assembly Jig consists of a base frame made of 3" channels, two sets of rigidly mounted rollers on which the motor tube is supported, a toggle clamp to prevent the motor from rotating while the head is being screwed in, and a cart which carries the head and locates it in the proper position for screwing into the motor. The height of a head cart is adjustable so that accurate alignment

may be made. Also included with the jig are three adapters and two clamps for fitting the jig to the Bomb and Torpedo Truck Mk 5 Mod 2, or Bomb Trailer Mk 2 Mod 1. The jig can also be mounted on a rigid table.

3. Two adapters are used in mounting the Assembly Jig on the Bomb and Torpedo Truck Mk 5 Mod 2. The steps in mounting are as follows:

(a) Remove jacks and jack cradle.

figure are of a different design from that described above.

4. In mounting the Assembly Jig on the Bomb Trailer Mk 2 Mod 1, the same front adapter is used, but for the rear adapter, the channel with the cut-away flange is used. The steps in making the installation are as follows:

(a) Bolt the front adapter to the jig frame. The front of the jig frame is the end at which the lateral braces are made of angle iron.

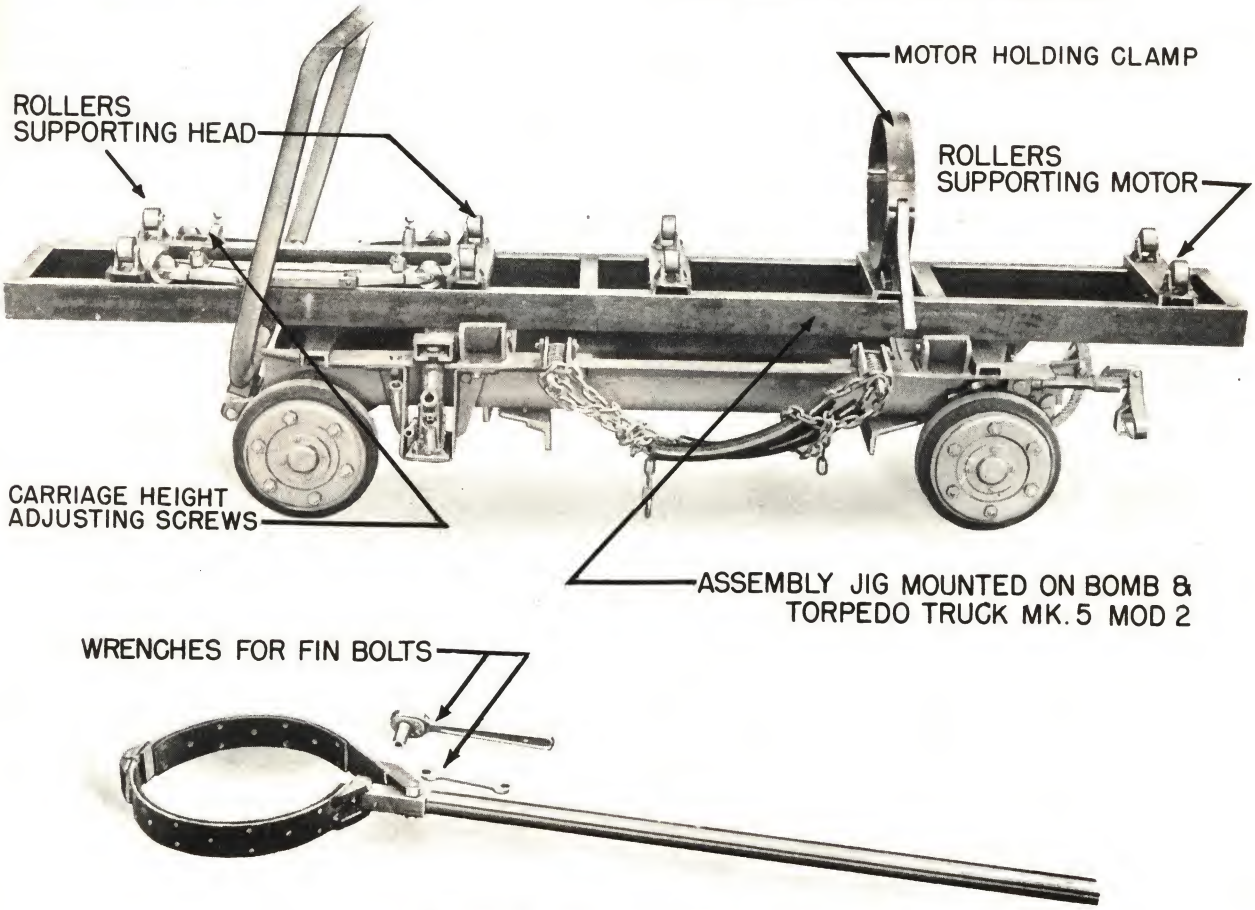


Figure 8—Assembly Equipment

(b) Bolt the clamps loosely to the front adapter.

(c) Bolt rear adapter to the frame of the truck.

(d) Bolt front and rear adapters to the base frame. The front of the base frame is the end with the lateral braces of angle iron.

(e) Engage clamps on front adapter with the frame of the truck and draw up tightly.

(f) Make certain that the jig is bolted securely to the truck before using.

It is to be noted that the adapters shown in the

(b) Bolt rear adapter to jig frame.

(c) Lay out and drill four holes in the Bomb Trailer, using the jig frame with adapters in place to locate the holes. Front holes are 7.50 inches apart. Rear holes are 4.000 inches apart and the spacing between the sets of holes is 49.00 inches.

(d) Place jig frame on the Bomb Trailer and bolt front and rear.

(e) Make certain that the jig is bolted securely before using.

5. If a table or bench is used for mounting the Assembly Jig, it should be not more than 2 ft. high and should have a good stable base, bolted down if possible so that it cannot be tipped over. It should be slightly shorter than the base frame of the jig (94″) and must be located so that it is accessible to the lifting equipment to be used in handling the rocket and rocket components. The bench is prepared for mounting the jig by drilling four holes to match the four holes in the bottom of the jig frame and should be placed on the bench so that the rear end of the jig is flush with the end of the bench.

6. After the assembly jig frame is suitably mounted, the roller assemblies, the clamp assembly, and the head cart should be placed in position on the frame and secured. The steps in assembling and adjusting are as follows:

(a) Disengage clamp bolts on roller assemblies and clamp assembly.

(b) Place roller assembly on jig frame in designated position and clamp loosely.

(c) Place clamp assembly between roller assemblies in designated position and clamp loosely.

(d) Place the head cart on the front of the frame and screw out retaining screws on under side.

(e) Make preliminary adjustment for height of rollers on the head cart.

(f) Place head on head cart, with rollers bearing on machined flat surfaces. Place motor on motor rollers. An inert head and motor should be used if available.

Figure 9—Hoisting Crated Motor with Carrier Mk 17 Mod 0 Attached to Handling Band

(g) Adjust motor rollers so that the motor rotates evenly.

(h) Adjust set screws on clamp assembly so they clamp motor firmly and toggle clamp functions evenly.

(i) Align head accurately with motor by adjusting height of cart.

(j) Test alignment by screwing head into motor several times.

(k) Make final adjustment of height and alignments and tighten lock nuts on head cart.

Figure 10—Hoisting Motor with Carrier Mk 17 Mod 0 Attached to Handling Band

(l) Remove head and motor and tighten clamps on roller assembly and clamp assembly.

(m) Make certain that all of the clamps are secure before using jig.

7. The strap wrench is used primarily to screw the head into the motor, but it may also be used to remove the thread protectors from the head and the motor. The circular portion of the wrench is hinged at the bottom and hooks into the projection of the handle at the top. In general use, the wrench will not be opened but will be slipped onto the front end of the head just in front of the forward set of rollers. There is not enough clearance between the head and the head cart to use a wrench at the middle of the head. Use of the strap wrench is preferable for assembling the head and the motor.

8. The spanner wrench is used to remove the motor thread protector, when it cannot be removed by hand, and to assemble the head and motor, when the strap wrench is not available. It is of simple design and is to be considered standby equipment.

9. The primary use of the ratchet wrench and end wrench is in putting on the tail assembly of the rocket, but they are also to be used on the lug bands, when adjustment is necessary. The soft mallet is to be used in driving the tail fin assembly into place on the motor tube.

VIII—ASSEMBLY PROCEDURE

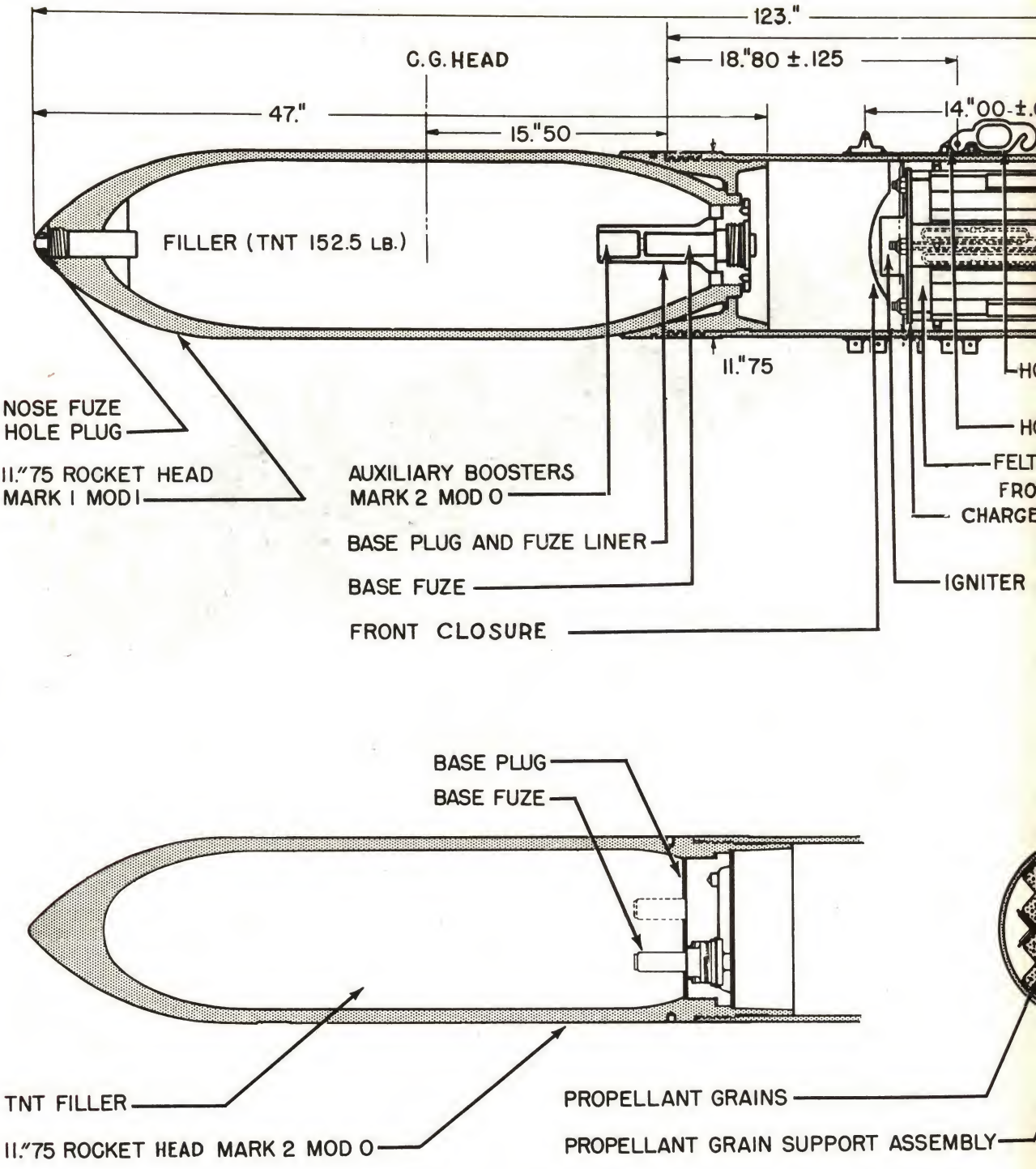
1. The following equipment is needed to assemble the 11.75-inch Aircraft Rocket:

(a) Crane or Bomb Service Truck.

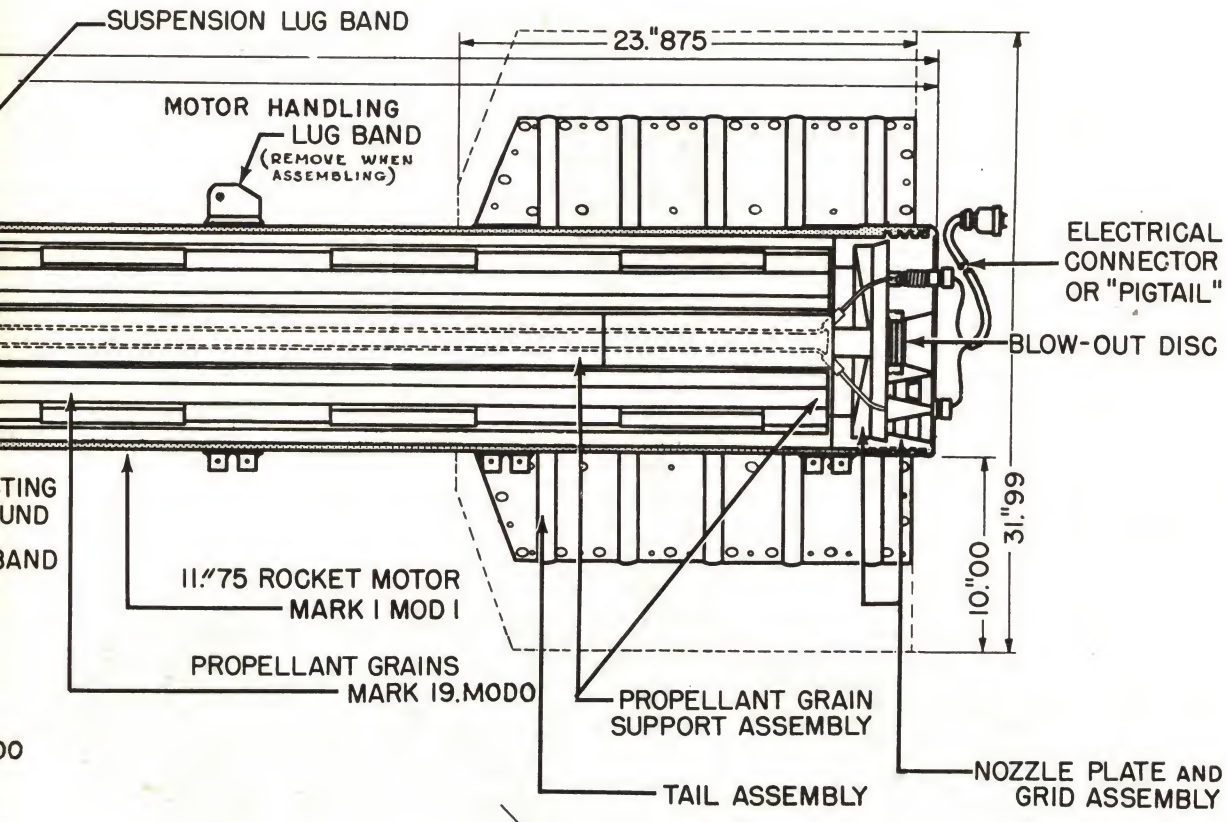
(b) Assembly Kit.

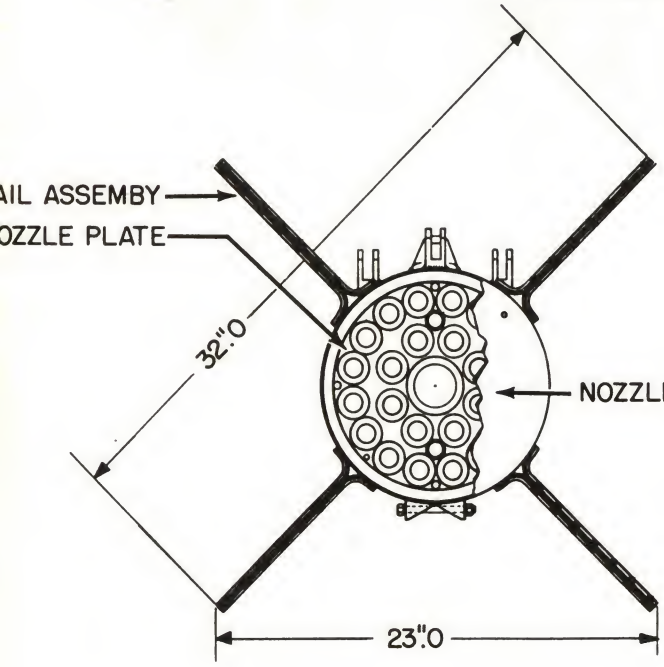
(c) Miscellaneous standard tools.

2. Lift the motor out of the shipping box, using the Carrier Mk 17 Mod 0 for attaching the crane



General Arrangement 11.75-inch Aircraft Rocket





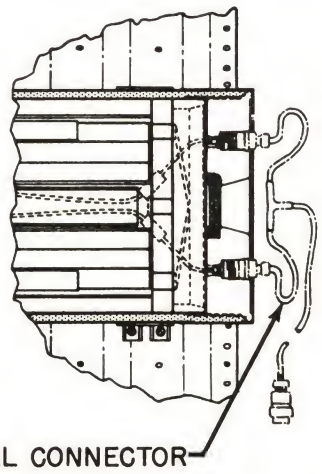


Figure 11—Handling Rocket Head with Carrier Mk 17 Mod 0

hook to the handling band located near the center of gravity of the motor.

3. Place the motor on the rollers of the assembly jig and clamp in place. The nozzle end of the motor should project beyond the end of the jig frame to permit attachment of the fin assembly.

4. Remove the motor handling band.

5. Remove the cap from the nozzle plate and the front shipping plug and its gasket.

6. Slide the fin assembly over end of motor and clamp in place by tightening nuts. The end of the fins with square corners is to be forward, and the end with the corner cut off at an obtuse angle is to be aft. In order to clear the flaps on the F4U when they are in the 30° position, the trailing edge of the fins must be ahead of the rear of the nozzle plate by 6 in. on motors Mk 1 Mod 0 or 1, and 3 in. on motors Mk 1 Mod 2 or 3. Instead of being installed symmetrically with the lug bands, the fins must be rotated clockwise (looking from the rear) 15° for starboard rockets and 15° counterclockwise for port rockets. This means that the clamping bolts on the fin bands will be approximately 2 in. out of line with those on the other bands. It will probably be wise at first to leave the fins loose on the motor until it is on the airplane and then position them for about 1 in. clearance with 30° flaps. After experience is gained, motors

can be made up in advance in equal numbers for port and starboard positions. It is to be noted that on the general arrangement drawing, the fins are shown with the obtuse angle forward and mounted flush with the rear of the motor tube. This is the normal arrangement when interference with wing flaps is not encountered.

7. Place the head on the assembly jig head cart with the cylindrical machined portion of the head on the rollers. Heads are equipped with handling bands.

8. Remove the handling band and the shipping cover, and protecting cuff or shipping cap from the head.

9. Check to see that base fuze is in place and that the inlet cup and screen on the fuze are undamaged and clean.

10. Check to see that the head and motor threads are clean, then oil or coat with grease. Threads of such large size are likely to gall if not well lubricated.

11. Note position of end of thread in motor and rotate head until end of its thread is aligned with end of motor thread. Back off head about one-eighth of a turn so that threads will not interfere when head is inserted.

12. Push head into the motor as far as it will go. Check to see that the distance from the end of the motor tube to the thread shoulder on the head is approximately $1\frac{9}{16}$". If so, the threads are just ready to engage. If the distance is more than this, the head must be pushed farther into the motor.

13. Screw the head into the motor using the strap wrench. Turn slowly at first until it is clear that the threads are engaged (pushing on the end of the head will aid in catching the threads). In case of binding, unscrew the head and investigate, since large diameter threads cannot be forced. The end of the motor tube must seat firmly on shoulder of the head.

14. Check that the suspension bands are tight. An 8 or 10 in. wrench should be used to tighten. If a torque wrench is available, tighten to 40 foot-pounds torque.

15. For units so equipped, remove the hoisting hook from hoisting lug band.

16. Check the location of the center of gravity by hoisting the rocket with the hoisting lug band. If one end of the rocket is more than $1\frac{1}{2}$ ft. higher than the other, move the hoisting lug band to center of gravity and readjust other bands accordingly.

17. The rocket is now ready to load on the aircraft.

IX—DROP LAUNCHERS

1. The recently developed drop launcher affords a simple means for firing the 11.75-inch Aircraft Rocket from suitable stations on an airplane to which a 1,600 bomb rack or shackle can be attached. A rocket can be released as if it were a bomb, and when it has fallen a sufficient distance to provide ample blast clearance (and also, if necessary, clear the propellers), a lanyard operates a switch, thereby igniting the rocket motor. To provide ample safety for long drops, the lanyard is made to turn a drum or reel which is so arranged that the switching action can occur only after the reel has made the proper number of rotations. This type of design, in which the lanyard must unwind from a reel against a steady opposing force, is preferable to one in which the lanyard actuates the switch by merely becoming taut, since, in the latter type, any snarling or fouling of the lanyard is likely to cause premature firing of the rocket.

2. The use of a drop launcher is based upon test results which show that the behavior of the rocket, when dropped "free," is sufficiently systematic so that a negligible dispersion in the trajectory results. However, two other conditions must also be fulfilled to permit firing from an airplane: (1) the rocket must fall, relative to the airplane, nearly perpendicular to the flight line, so that the effective lanyard length is not reduced, and (2) the rocket orientation at time of firing must be satisfactory with respect to the blast effects on airplanes. It has been found that both of these conditions are fulfilled on some airplanes for any flight conditions likely to be encountered in service use. For example, on the F4U airplane, tests have shown that

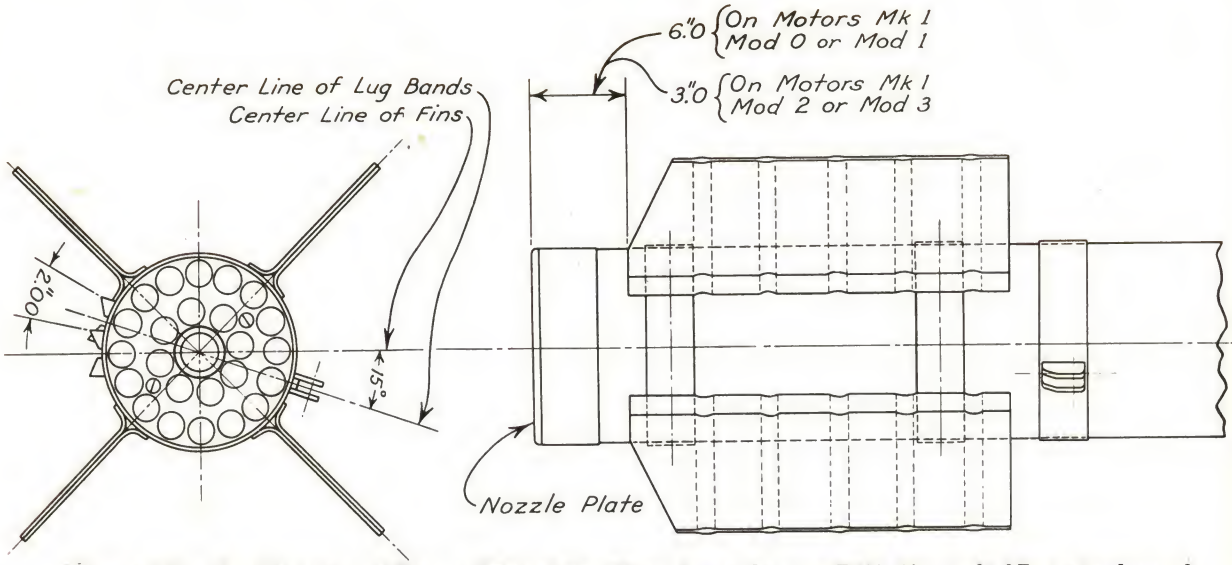


Figure 12—Positioning of Fin on Rocket for Port Launcher on F4U Aircraft (For starboard launcher, fin is rotated in opposite direction by same amount.)

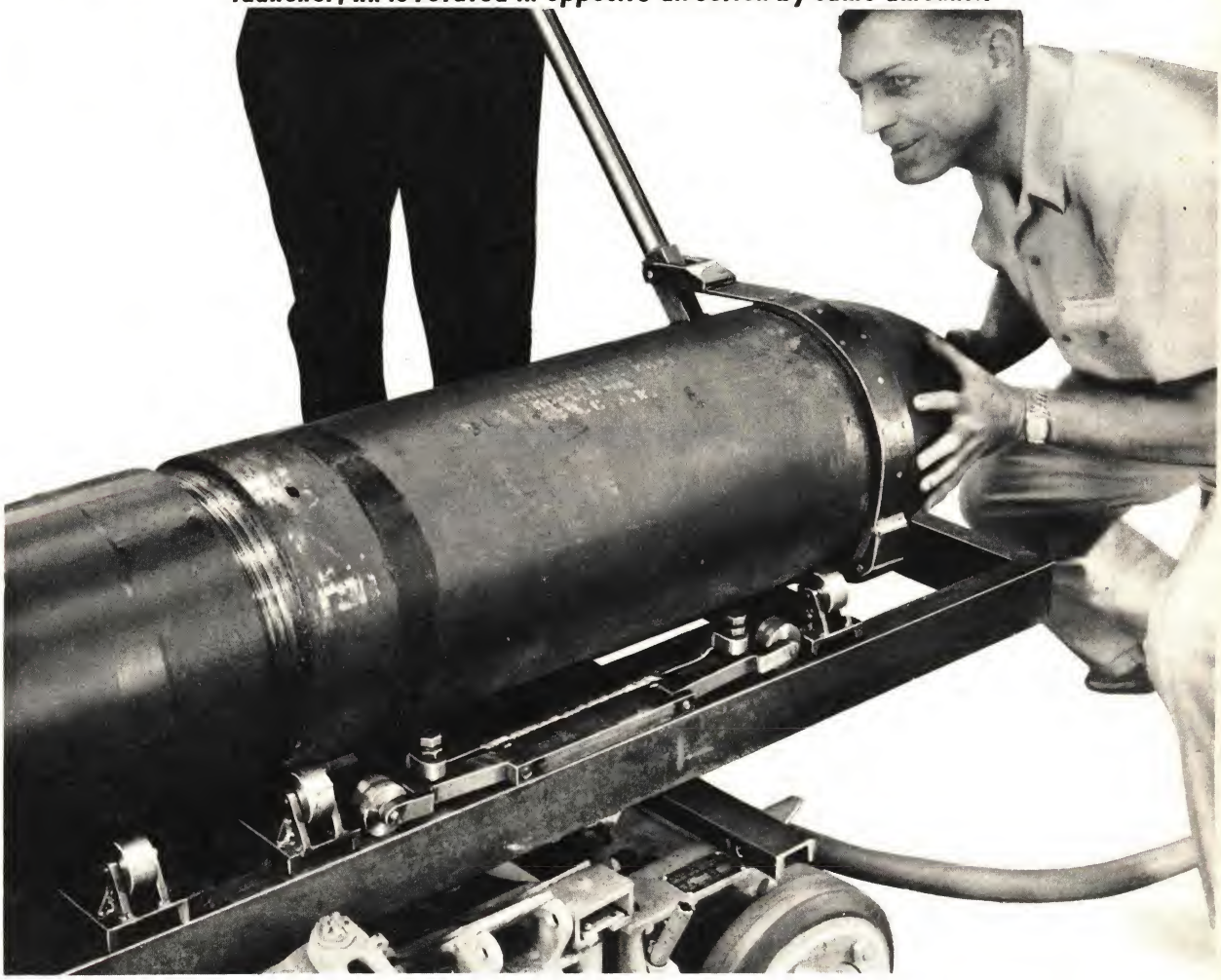


Figure 13—Assembling Head and Motor

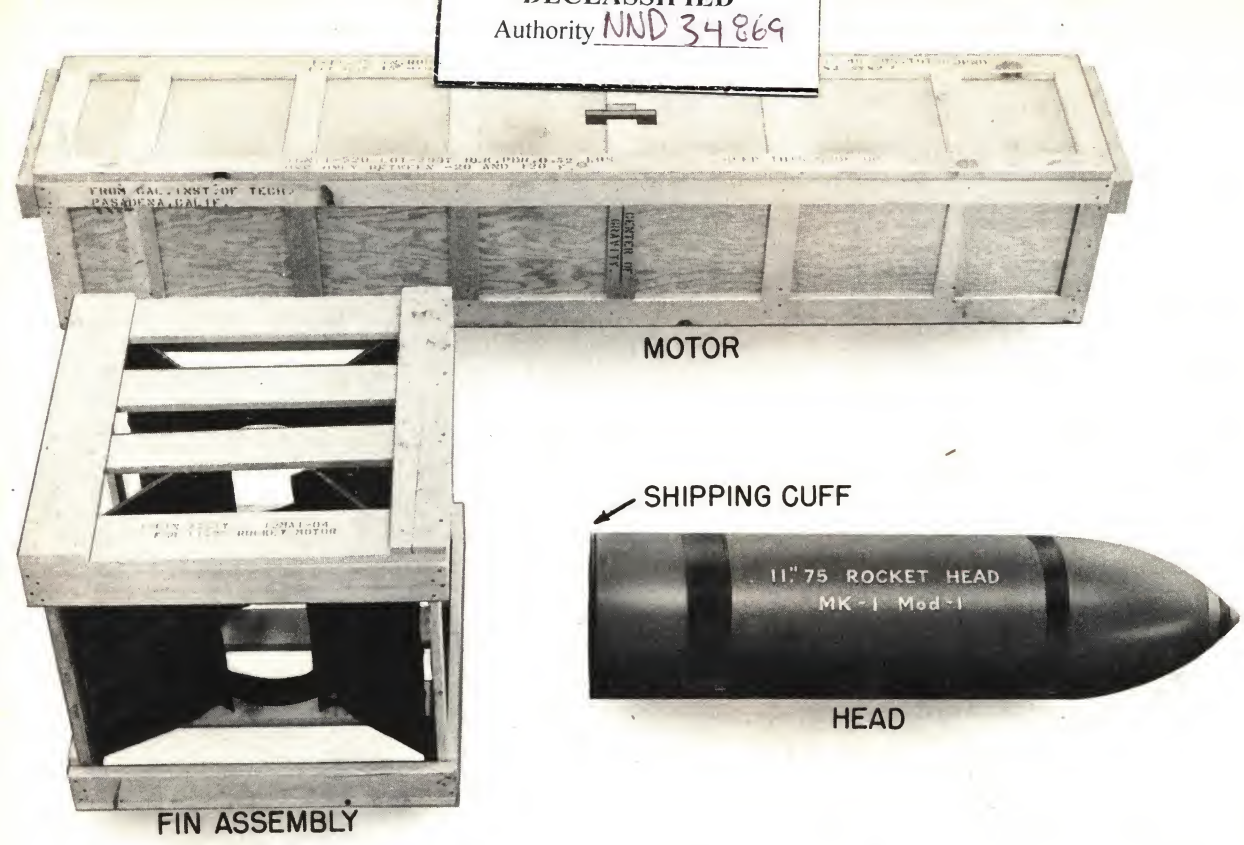


Figure 14—Rocket Components as Shipped
(Note: The fin assembly is to be shipped in a steel box instead of the crate as shown.)

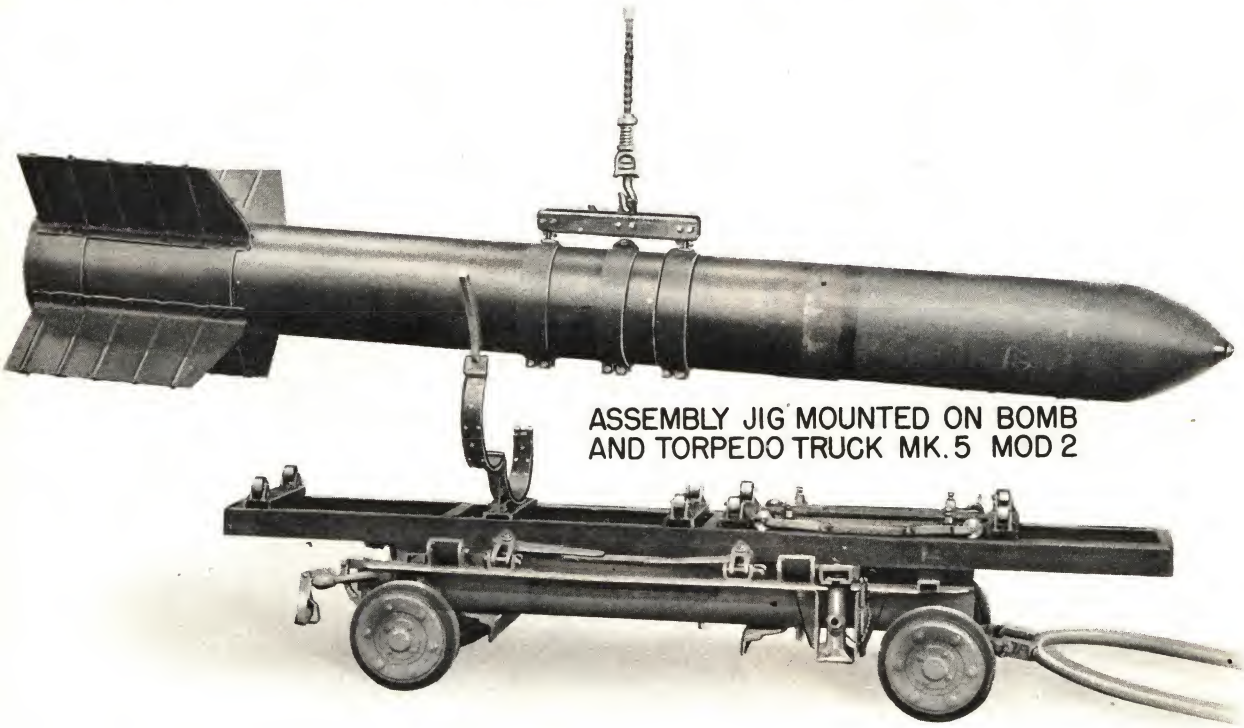


Figure 15—Handling of Assembled Rocket with Bomb Carrier Mk 4 Mod 0

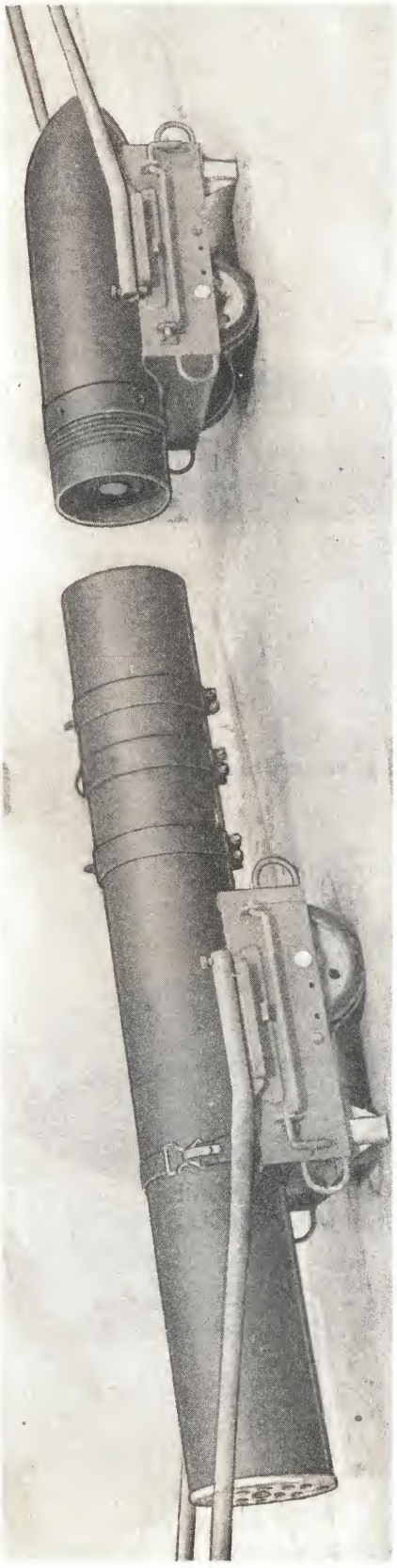


Figure 15a—Head and Motor on Bomb Skids Mk 1 Mod 1—Ready for Assembly

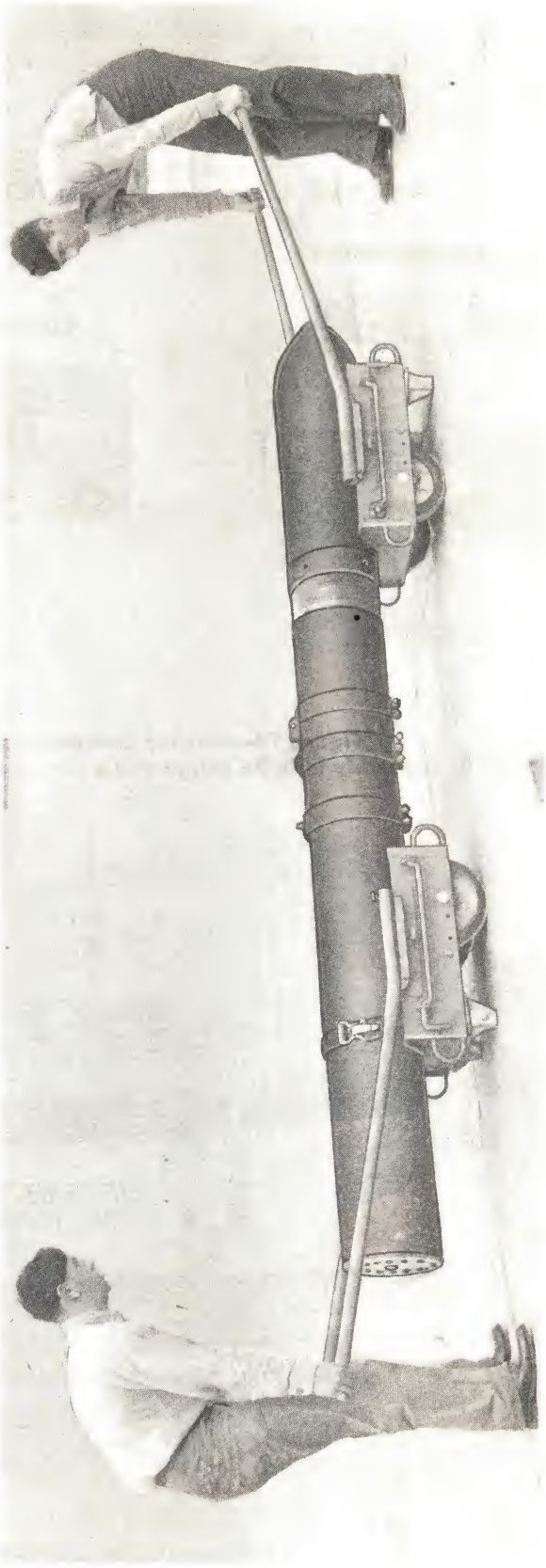


Figure 15b—First Step in Assembling Head and Motor Using two Bomb Skids Mk 1 Mod 1

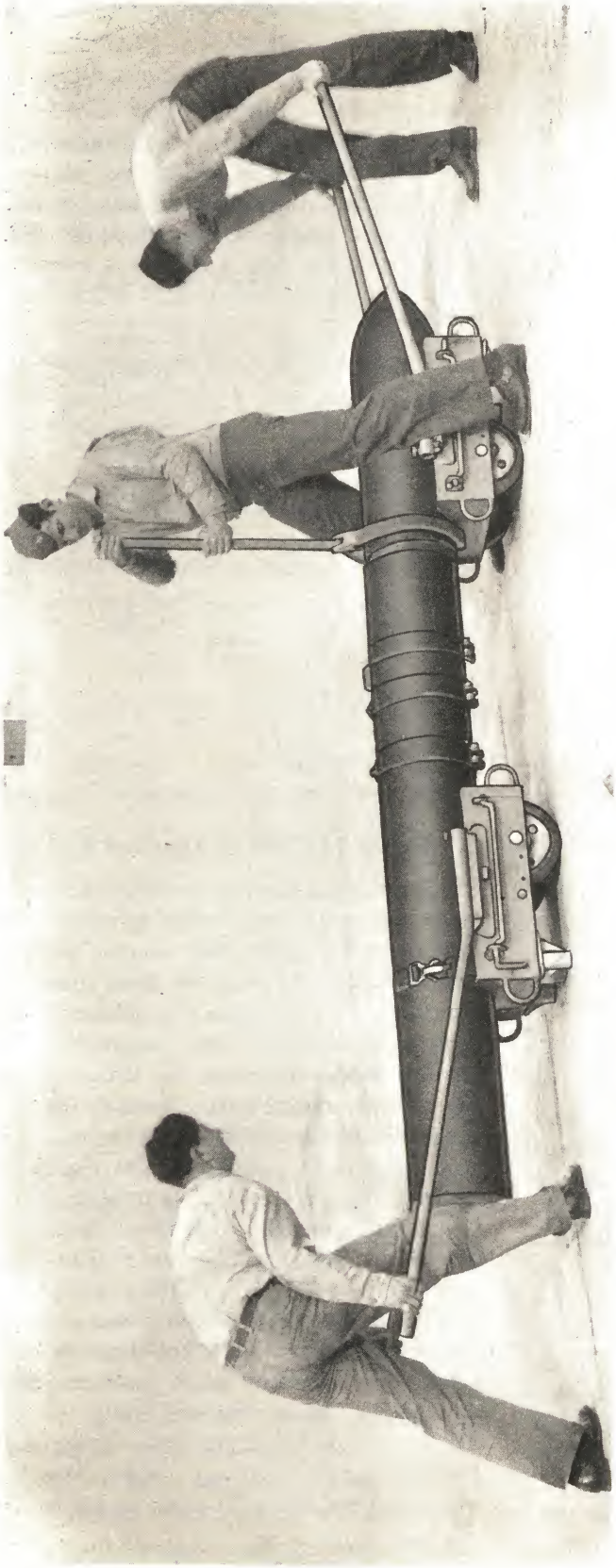


Figure 15c—Assembling Head and Motor Using Strap Wrench to Turn Head

Figure 15d—Head and Motor Assembled

it is permissible to fire at dive angles up to 60 degrees, provided dive brakes are not used. It should be emphasized the dive brakes must not be used if drop launching from an airplane in steep dives is contemplated.

3. The lanyard reel switch consists of a drum or spool, a friction brake, a gear train, two cams, two limit switches, and a housing or case. These components will be considered individually in the above order.

4. The drum, upon which the steel lanyard is wound, is quite short in relation to its diameter and, thus, will accommodate a great length of lanyard per turn. The lanyard wire, which is a length of $\frac{1}{16}$-inch aircraft control cable, is scatter-wound upon the drum with its step-formed end locked in a small hole in the bottom of the drum groove. As this lanyard unwinds from the drum, the step-formed end insures that the drum will turn with it, and when the lanyard is completely unwound, the stepped end is unlocked and is easily pulled from the hole in the drum.

5. The drum is so designed that it has a cylindrical surface inside, suitable for operation with a steel brake band to form a friction brake capable of developing 10 to 15 pounds resistance to the unwinding of the cable. The brake band is a $1\frac{1}{2}$ turn helix of ribbon alloy steel. The band is fastened at one end to a post projecting from the housing, producing a unidirectional braking, similar in principal to that of the belt wrapped around a moving pulley. It is, thus, easy to wind the lanyard onto the drum, but rather difficult to pull the lanyard off the drum.

6. The drum is fixed to its shaft with a semicircular key, and, as it turns, drives a branched gear train, which reduces the speed of rotation by a factor of 14. Into the flat surface of each of the two slow-speed gears, there is machined a shallow groove with a trapezoidal shaped cam block inserted in it. The small actuating pin of a YZ–7RTC limit switch projects into each of these grooves and is operated by the cam, as the gear rotates into the proper position. The cams operate the limit switches simultaneously. These limit switches are pressed against the gear surfaces by spring action and cannot be actuated except by the cam, since the grooves in the gears are too deep for the limit switch pin to reach the bottom of the groove before the limit switch case strikes the gear surface.

7. The electrical receptacle, with a single terminal, conducts a firing circuit into the unit, and, after passing through the two limit switches connected electrically in series, the current emerges from the unit, through a conduit leading directly to the firing receptacle into which the rocket Electrical Connector Mk 8 Mod 0 is inserted.

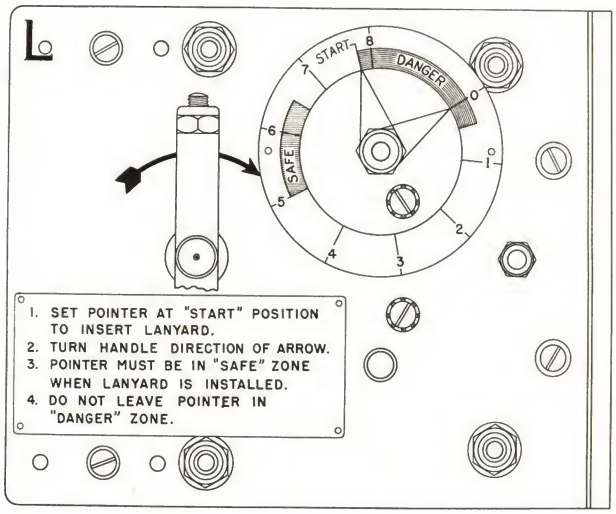


Figure 16—Dial of Lanyard Reel Switch

8. The entire system described above is housed in an aluminum case which is suitably machined to provide weatherproof sealing of the limit switches and cams from the drum chamber and the outside air. The pointer attached to one of the cam gears indicates the approximate length of lanyard cable wound on the drum. A red band covers that portion of the pointer's sweep near the range of operation of the limit switches, to register warning when the switches are closed or nearly closed. When the drum has turned approximately two turns beyond the point where the limit switches are closed, these switches open again and a half turn later the lanyard pulls free. At this time the pointer will be at the "start" mark on the scale. When the lanyard is on the drum, a small brass safety wire fixed to it is inserted into a hole through the case and twisted firmly. This prevents the lanyard on the drum from having any tension placed upon it until the safety wire is broken, which will require a 50 or 60 pound pull.

9. The over-all dimensions of the main body of

the unit, excluding the projecting handle, electrical receptacle, and mounting bracket are approximately 1½ x 4½ x 5½ inches, and its total weight, complete with brackets, is about 3½ pounds.

10. The switches are furnished in right and left hand units. The right hand unit mounts on the outboard side of the bomb station on the right hand side of an airplane, and a left hand unit mounts on the outboard side of the bomb station on the left hand side of an airplane. It is recommended that these switches never be disassembled or repaired, except by personnel who are thoroughly familiar with the difference between right and left hand types and who have knowledge of the requirements of safety and reliability which must be met by the switch.

X—ROCKET LAUNCHER TESTING DEVICES AND PROCEDURES

1. The circuit testing devices now in service include the Circuit Test Kit Model I, Circuit Test Kit Model II, the Circuit Test Plug Model I, and various "home-made" devices.

2. The Test Kit Model I was designed to test the function and continuity of the rocket circuit; a limited quantity was made, and it has been supplanted by the Test Plug Model I. The latter is a compact plastic plug with a 26 volt light bulb and an electrical plug to match the rocket launcher receptacle.

3. The Test Kit Model II was designed to test for stray low voltage in the launcher circuit and to provide an auxiliary means for testing the bulbs in the test plugs. It consists of a case containing a low voltage light bulb, 5 pencil type flashlight cells, a resistance, a receptacle, a switch, and a short electrical lead with a plug to fit the launcher receptacles. As a safety measure, the socket on the case was designed to allow the electrical plug of the test kit to make contact with the battery through the resistance, but to prevent the shorter pins of a rocket pigtail plug from reaching the battery circuit in case a rocket is inadvertently plugged into the test kit. The extra long pins of the test plug will reach a switch within the test kit, thereby shorting out the resistance and allowing the full 7½ volts of the battery to light the test plug.

4. Continuity tests should be carried out to check the firing circuit and the operation of the reel switches. If the launcher has been operating satisfactorily, the continuity tests need be performed only as often as on other armament circuits during normal operation or after unloading rockets, after misfires have occurred. *Continuity tests should never be performed with rockets loaded on launchers.*

5. To perform a continuity test proceed as follows:

(a) Be positive there are no rockets loaded on launchers.

(b) Insert a test plug into each rocket launcher receptacle.

(c) Close all necessary switches, including the firing switch.

(d) Turn the pointer on the lanyard reel switch to zero. The test plug should light.

(e) Continue turning the winding handle on the reel slowly in the direction indicated by the arrow. The test plug should indicate no voltage as soon as the pointer is moved away from the zero mark on the scale. If the surroundings are quiet enough, one should hear *both* limit switches snap in close succession. Now turn the handle in the direction opposite that of the arrow. As the pointer crosses the zero mark, the test plug should again light.

(f) Turn off all switches.

6. *The following safety test must be performed immediately before plugging the Rocket Electrical Connector into the Launcher Receptacles:*

(a) Verify that all armament switches and firing switches are off.

(b) Plug the Launcher Test Kit Model II into each launcher receptacle in turn and observe that the bulb does not glow.

(c) *Insert the test kit plug into the test kit receptacle to check the functioning of the test kit bulb. If the bulb fails to glow when plugged into the launchers, but lights when plugged into the battery circuit of the test kit,* the launchers are free of dangerous stray voltage; the rocket pigtails may then be plugged into the launchers.

(d) If the bulb glows when plugged into the launcher or fails to glow when plugged into the

battery circuit of the test kit, *do not plug in pigtails.* In the former case, follow procedure (j) below; in the latter case, follow procedure (e) through (j) below:

(e) Replace the bulb in the test kit circuit with the spare that is provided with each kit.

(f) Test the functioning of the new bulb by inserting the test kit plug into the test kit receptacle.

(g) If the bulb fails to glow, the test kit is defective, and the entire safety test should be repeated with a new test kit.

(h) If the bulb glows when tested, the entire test procedure should be repeated, carefully watching the bulb.

(i) If the bulb is observed to glow or to burn out when plugged into the launchers, or if the bulb again fails to glow when the kit is checked at the end of the test procedure, the plane is unsafe to carry rockets.

(j) Unload rockets and restrict the plane from carrying rockets until such time as the launcher circuits can be checked and the stray current eliminated.

NOTE: Any tester employing a light bulb rated at 2 volts or less can be satisfactorily used. The recommended bulb is Mazda 351.

XI—F4U AIRCRAFT LAUNCHER INSTALLATION AND LOADING PROCEDURE

1. The launcher consists of a bomb shackle with the reel-type lanyard firing switch described above. The bomb shackle is mounted in a pylon which is standard equipment on this airplane. It is located on the center wing section about 3 feet from the center of the fuselage. The Bomb Shackle AN–B10 has the usual manual release and, in addition, is provided with an electrical release mechanism.

2. The firing switch case and firing receptacle are bolted to the outboard side of the pylon. A streamlined fairing on that side is trimmed to clear the switch and to provide ready access to the inside of the housing from that side. The bottom skirt of the pylon serves as a sway brace. A slight modification is necessary in order to adapt it to the 11.75-inch Aircraft Rocket but this does not affect the use of the pylon to carry gas tanks or bombs.

3. A special bracket has been added to the inboard side for a single Hoist Mk 7 Mod 1 with either bombs or the 11.75-inch Aircraft Rocket.

4. The following equipment is needed for loading:

(a) Skid Mk 5 Mod 1 or Truck Mk 5 Mod 2 preferred.

(b) Hoist (Portable Bomb) AN Mk 7 Mod 1.

(c) Bolt AN–6011 (⅜ x 1½ long). The bolt provided with the hoisting band on some units may be used. A ⅜ clevis bolt AN–396–47 with washer AN–960–616 and spring locking pin AN–415A may be used instead of the bolt.

(d) Tool kit—Miscellaneous standard tools.

5. The loading procedure is as follows:

(a) The equipment must be carefully inspected for broken or damaged parts. Electrical conduits should be free of dents, and plastic sheathing should be undamaged.

(b) The friction brake should be checked for proper operation. Turn the handle about a half turn, first with the arrow and then in the opposite direction. The handle should turn smoothly in both directions although with much more ease in the former direction than in the latter. If this is true, the friction brake is in a satisfactory operating condition.

(c) To test the electrical circuit to determine that it is safe under conditions that exist in flight just before firing, proceed as follows:

(1) Be positive there are no rockets loaded on launchers.

(2) Turn pointer to the position it occupies when the lanyard is wound on the reel.

(3) Turn on all armament switches except the firing switch.

(4) Plug in the Launcher Test Kit Model II into each launcher receptacle.

(5) If the bulb glows, the circuit is faulty and rockets must not be loaded on the aircraft.

(6) If the bulb does not glow, test the bulb as in section X, paragraph 5, parts (e) through (j).

(d) Turn the drum handle until the pointer is at the start position. The small hole in the drum

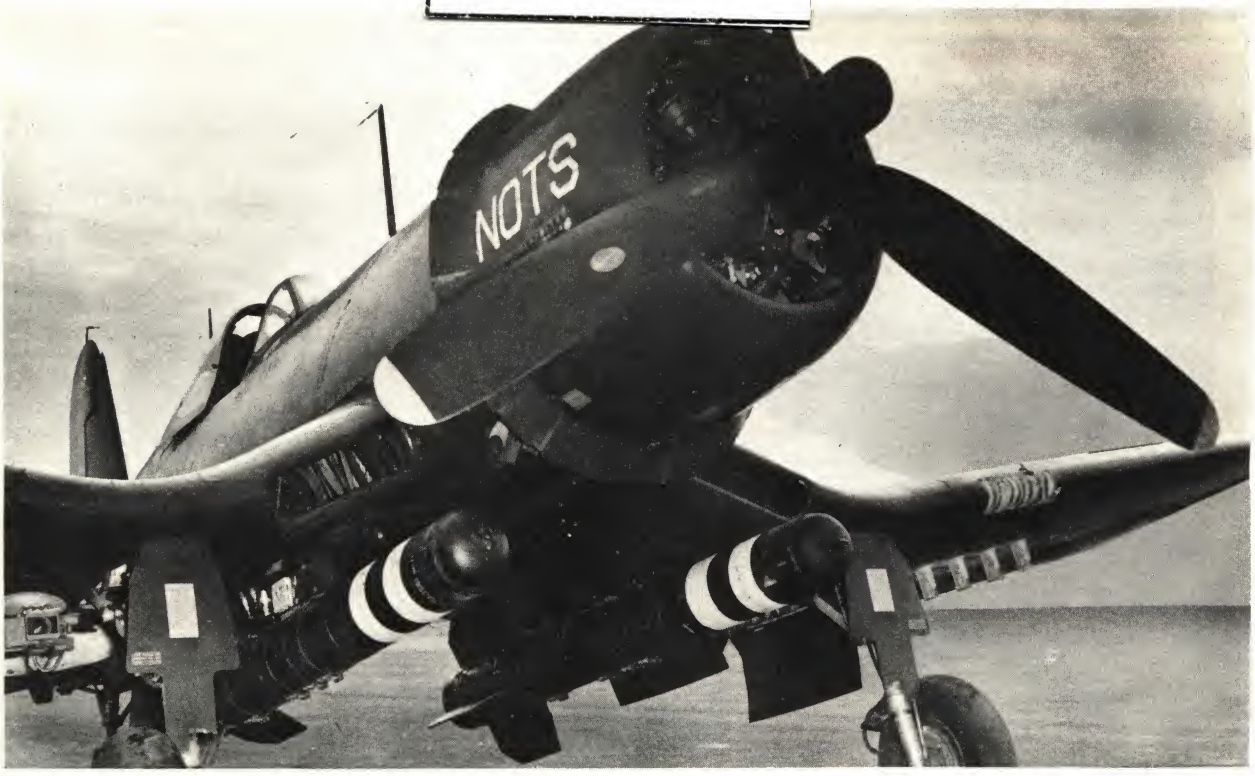


Figure 17—Two 11.75-inch Aircraft Rockets (with Dummy Heads) Loaded on F4U–1D Aircraft

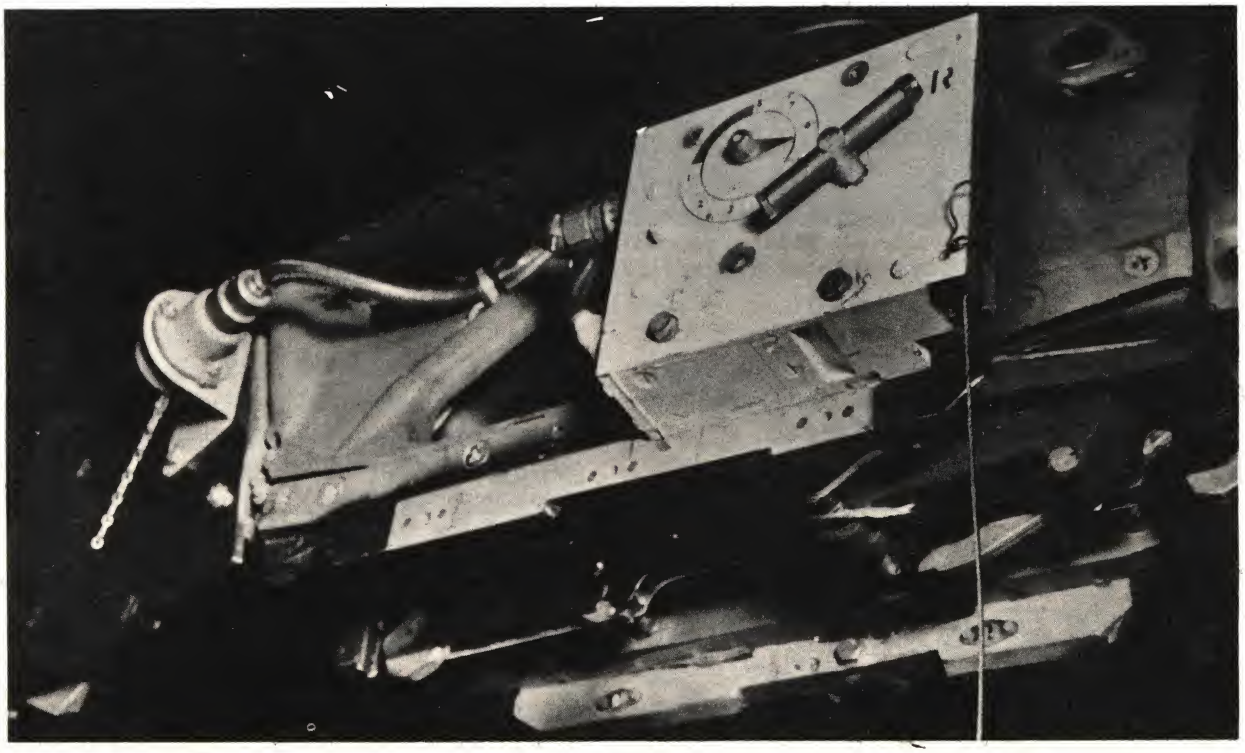


Figure 18—Lanyard Reel Switch on Starboard Pylon of F4U–1D Aircraft

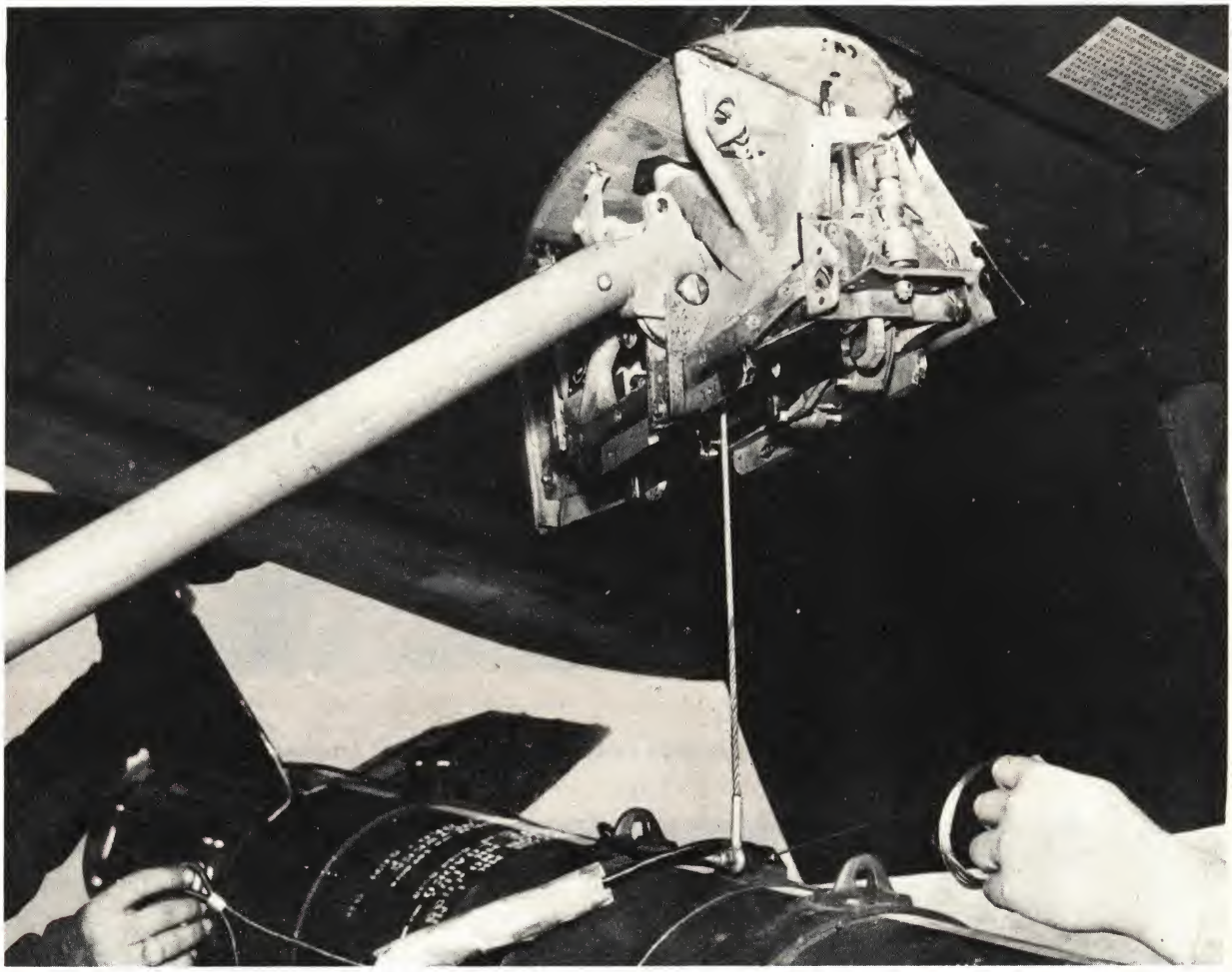


Figure 19—Hoisting Rocket onto Bomb Shackle on F4U–1D Aircraft (Note that lanyard cable and electrical connector are secured to hoisting lug before rocket is lifted into position. Obsolete type of firing line is shown in this photograph.)

should be in view, and the switch unit is now ready for the insertion of a lanyard cable. The lanyard should not, however, be inserted and wound until the rocket has been hoisted into position.

(e) Make certain that all arming and firing switches are open.

(f) Remove the fairing from the inboard side of the pylon with a screwdriver.

(g) Roll the assembled round on the dolly under the aircraft. Suspension legs should be directly under the hooks of the bomb rack.

(h) A special adapter is provided on the inboard side of the pylon for the Bomb Hoist Mk 7 Mod 1, which is used in the loading operations. Install the hoist and attach the hoisting cable, igniter cable and lanyard, using the ⅜-inch bolt provided. The igniter cable should be properly secured at the nozzle plate by bolting the clip, using the bolt hole for the cover plate. Attach the electrical connector plugs to the receptacle in the nozzle plate of the rocket after removing the shorting plugs, *but do not plug into the socket on the reel switch.*

(i) There are two ½-inch bolts in the pylon which support the Bomb Shackle AN–B10. The nuts on these bolts should be unscrewed about ¾ inch to lower the shackle. Hoist the rocket until the support lugs on it can be engaged by the shackle and then lock the shackle. The lanyard cable

should be led out of the pylon at the outboard front corner. After locking the shackle, install the anti-release bracket which will prevent accidental opening of the shackle during remainder of the hoisting operation. Remove the hoist, but do not remove the bolt from the hoisting band. This bolt serves to hold the lanyard and the electrical connector, and must have the nut replaced on it after the hoist has been removed. With a wrench, tighten the ½-inch nuts supporting the pylon, until the rocket is held rigidly. The rocket may be lifted at either end to remove its weight from the bolt which is being tightened, thus reducing the wear on the threads. Care should be taken that the nuts are not tightened too far, because the mounting bolts may be overstressed or the shackle may be loaded so much that it will not release. In no case should the nuts be tightened up more than ¼ turn beyond the place where all slack is taken up.

(j) Another method of hoisting utilizes a ⅜-inch clevis pin instead of a ⅜-inch bolt at the hoisting lug on the rocket. Install the electrical connector, lanyard and hoist fitting, using a Clevis Pin AN396–47, a Washer AN960–616 and a Spring Locking Pin AN415A. Hoist the rocket until the shackle will engage the lugs on the rocket. Lock the shackle and insert the anti-release bracket, which will prevent accidental release from the shackle during the rest of the hoisting operation. Continue hoisting the rocket until it just touches the sides of the pylon which act as sway braces. Turn the ½-inch nuts supporting the shackle until they are finger tight and remove the lock pin and washer from the clevis pin. Remove the hoist and reinstall the lock pin. The clevis pin must not be removed from the hoisting bands, as it holds the lanyard and firing line. Tighten the ½-inch nut with a wrench until the rocket is held rigidly.

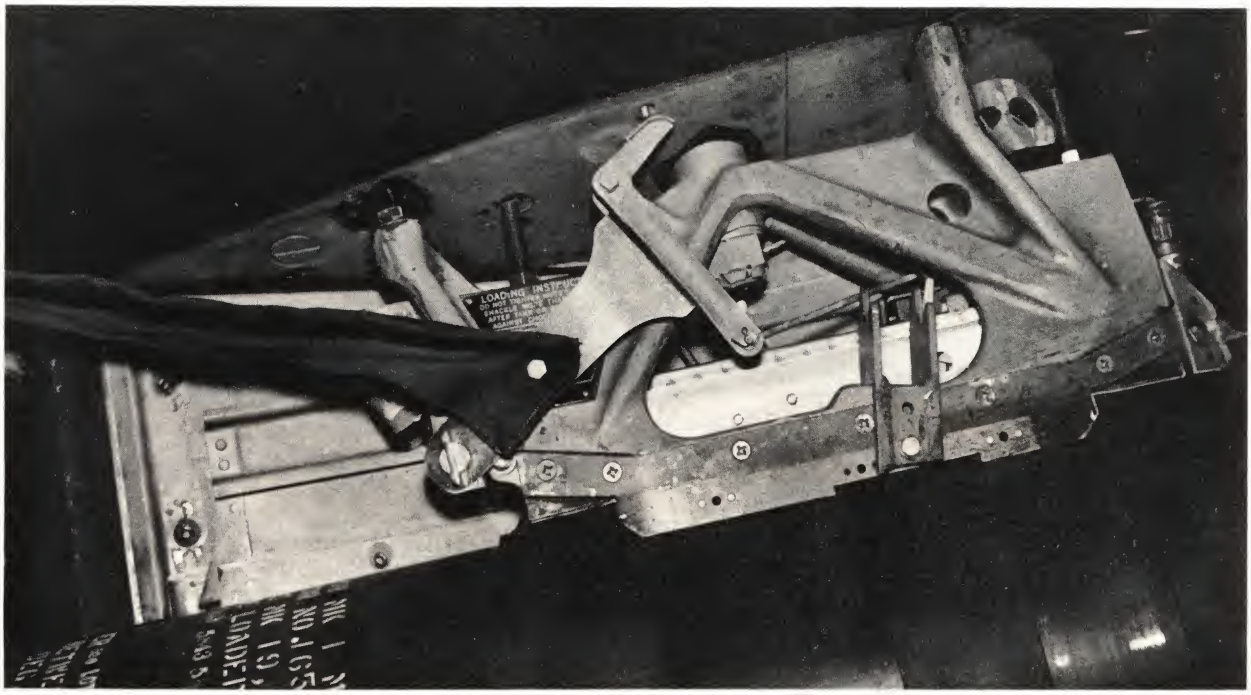


Figure 20—Anti-Release Bracket on Bomb Shackle AN–B10 (This bracket must be removed before aircraft leaves the deck.)

(k) The lanyard should then be wound on the reel. Turn the handle of the reel switch until the pointer on the side is at the start position. Insert the stepped-form terminal of the cable into the small hole of the drum and turn the drum in the direction of the arrow. In winding the cable onto the reel drum, care must be taken to keep all kinks out of the cable since such kinks, which are usually caused by excessive twisting during handling, may

cause breaking of the cable during unwinding. The cable should lie down upon the drum smoothly and tightly. Wind the cable up under approximately two pounds tension until the small brass safety wire is ready to insert into the case. Then pull the cable downward slowly out of the case against the friction brake, until the safety wire can be inserted into the small hole in the lower forward corner of the case. Pass the safety wire through this hole without relaxing tension on the cable, and secure it by twisting the ends together. The cable may now be released. If this procedure is properly carried out, the cable will be tightly wound upon drum, and release of the cable will not cause it to become loose.

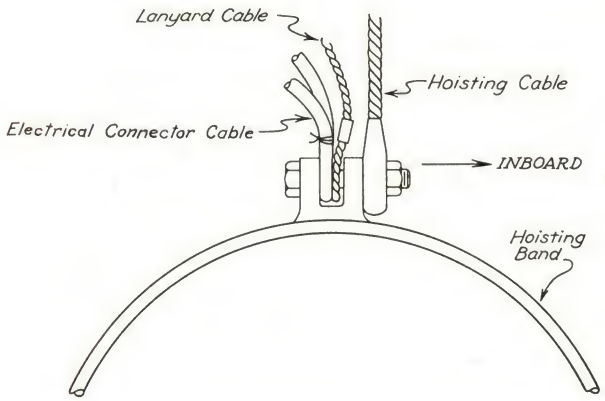


Figure 21—Attachments to Hoisting Band

(l) The process of pulling the cable out of the reel before securing the safety wire affords a further opportunity to check the friction brake. If the tension required to pull the cable from the reel against the friction brake is between 5 and 20 pounds, adjustment of the brake is correct.

(m) Remove the anti-release bracket from the inboard side of the pylon and install the fairing on the pylon. It should be noted that the fairing cannot be replaced unless the bracket has been removed.

6. A final inspection must be made and should include the following points:

(a) The electrical connector must be properly let out of the back end of the pylon (not wedged between the sway brace and rocket).

(b) The lanyard must be properly led out of the front of the pylon and must be properly laid on the reel and secured with the safety wire to the reel case.

(c) *The pointer on the reel case must be at the proper point and not in the danger zone. This is very important since, if the above condition does not hold, the lanyard has been improperly installed and will result in a premature firing or a misfire.*

(d) If the fairing is not replaced on the inboard side of the pylon, special care must be taken to remove the anti-release bracket. A red flag on this bracket should be sufficient reminder to insure its removal.

7. The electrical connector is not plugged in until after the launcher circuit has been checked with the Rocket Launcher Test Kit Model II, to see that the circuit is dead, according to the procedure in section X, paragraph 6, parts (a) through (j).

8. Plug the electrical connector into the socket on the Launcher.

XII—F6F AIRCRAFT LAUNCHER INSTALLATION AND LOADING PROCEDURE

1. The launcher consists of the Bomb Rack Mk 51 Mod 7 and the reel-type lanyard switch described above. The bomb rack installation is standard on this airplane. There are two bomb stations, one on each wing. Either or both stations may be used to carry 11.75-inch Aircraft Rockets. The standard sway braces (Grumman Part No. 28679) has been modified for use with 11.75-inch Aircraft Rocket but can still be used for standard bombs. The wing flaps can be fully extended with the 11.75-inch Aircraft Rocket in place. It is not possible to catapult the airplane with the rocket in place.

2. The firing switch case and the firing receptacle are mounted on the outboard side of the bomb rack. This makes it impossible to install the cover plate on that side, but in no way affects the operation and use of the bomb rack with either bombs or the 11.75-inch Aircraft Rocket.

3. The same equipment is needed for loading as listed above.

4. The loading procedure is as follows:

(a) Before inserting a lanyard cable, the equipment must be carefully inspected for broken or damaged parts. Electrical conduits should be free

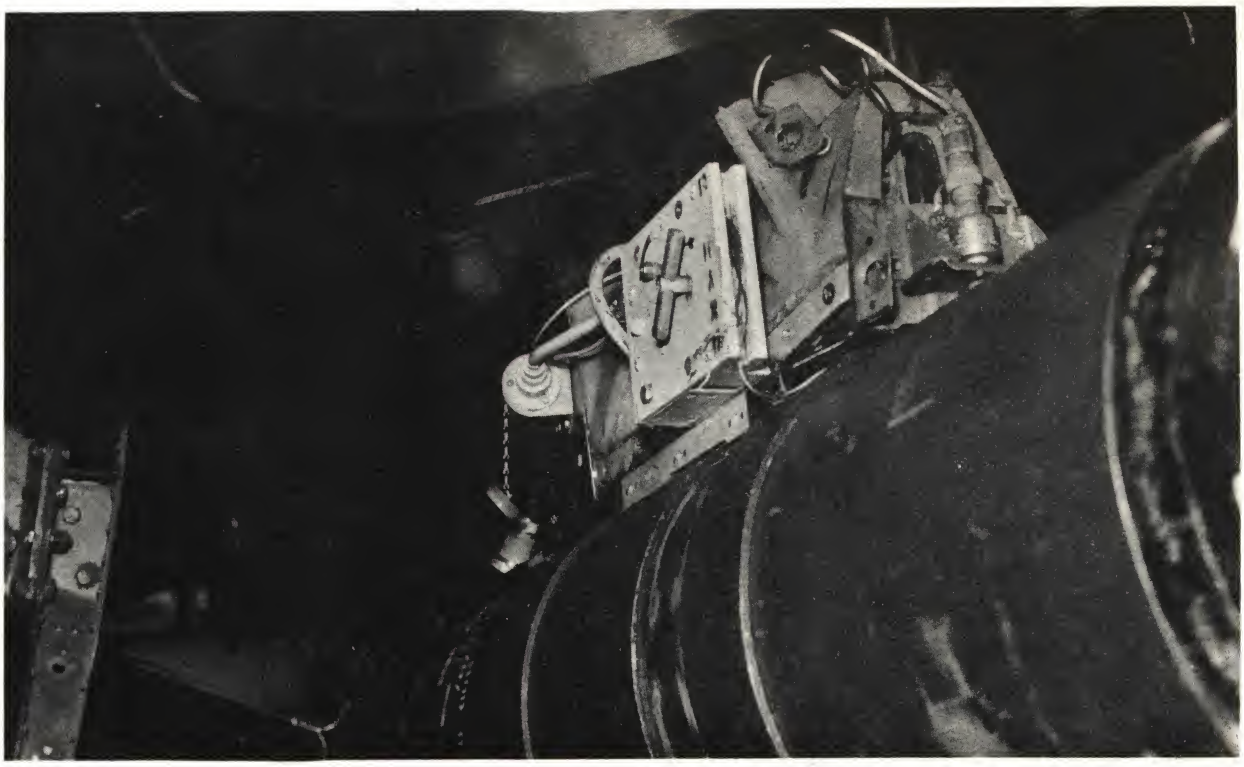


Figure 22—11.75-inch Aircraft Rocket Secured to Bomb Shackle on F4U–1D Aircraft

of dents and plastic sheathing should be undamaged.

(b) The friction brake must be checked for proper operation. Turn the handle about a half turn, first with the arrow and then in the opposite direction. The handle should turn smoothly in both directions although with much more ease in the former direction than in the latter. If this is true, the friction brake is in a satisfactory operating condition.

(c) To test the electrical circuit to determine that it is safe under conditions that exist in flight just before firing, proceed according to section XI, paragraph 5, part (c).

(d) Turn the drum handle until the pointer is at the start position. The small hole in the drum handle should be in view, and the switch should now be ready for insertion of the lanyard cable.

(e) To wind the lanyard cable onto the drum, insert the stepped-form terminal of the cable into the small hole in the drum, and turn the drum in the direction of the arrow. In winding the cable onto the reel drum, care must be taken to keep all kinks out of the cable. Such kinks, which are usually caused by excessive twisting during handling, may cause breaking of the cable during unwinding. The cable should lie down upon the drum smoothly and tightly. Wind the cable up under approximately 2 pounds tension until the small brass safety wire is ready to disappear into the case. Then pull the cable downward slowly out of the case against the friction brake, until the safety wire can be inserted into the small hole in the forward corner of the case. Pass the safety wire through this hole, without relaxing the tension on the cable, and secure it by twisting the ends together. The cable may now be released. If this procedure is properly carried out, the cable will be tightly wound upon the drum and the release of the drum will not cause it to become loose.

(f) The process of pulling the cable out of the reel, before securing the safety wire, affords a further opportunity to check the friction brake. If the tension required to pull the cable out of the reel against the friction brake is between 5 and 20 pounds, adjustment of the brake is correct.

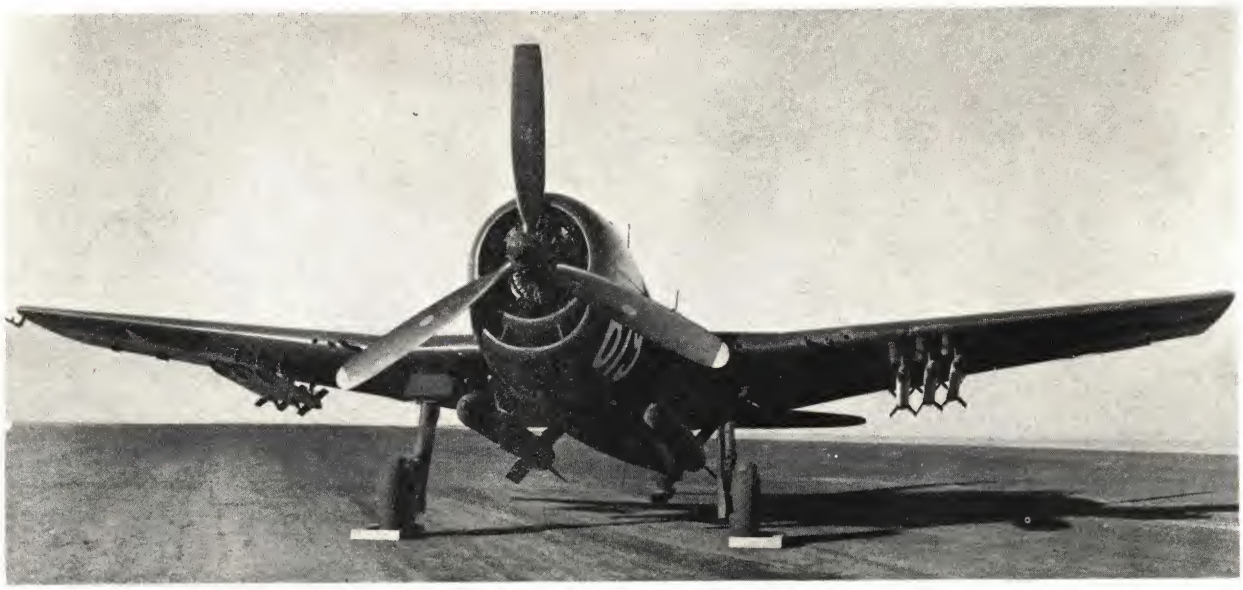


Figure 23—Two 11.75-inch Aircraft Rockets and Six 5.0-inch Rockets (5.0-inch Motors) Loaded on F6F–5 Aircraft

(g) Make certain that all arming and firing switches are open.

(h) Before loading begins, back off all four (4) jackscrews on sway braces so that they will clear the round when it is hoisted into position.

(i) Roll the assembled round on the skid or truck under the aircraft. Suspension lugs should be directly under hooks of the bomb rack.

(j) Hoist the rocket up and attach to the bomb rack. The electrical connector should then be attached to the rocket, but *should not be plugged into the socket on the launcher.* A loop is provided in the cable about 60 inches from one end. This loop and the loop on the end of the lanyard cable are fastened to the hoisting lug on the rocket using a ⅜-inch bolt. The electrical connector is passed under the rear sway brace and plugged into the end of the rocket, after removing the shorting plugs. The electrical connector cable is properly secured to the nozzle plate. Adjust the sway braces finger tight plus one half turn.

5. A final inspection must be made and should include the following items:

(a) The electrical connector must be properly secured at the hoisting lug.

(b) The steel lanyard must be properly secured at the hoisting lug.

(c) The steel lanyard must be properly laid on the reel and secured at the reel case with the safety wire.

(d) *The pointer on the reel case must be at the proper point and not in the danger zone.* This is very important, since, if the above condition does not hold, the lanyard has been improperly installed and will result in a premature firing or a misfire.

6. The electrical connector is not plugged in until after the launcher circuit has been checked with the Rocket Launcher Test Kit Model II, to see that the circuit is dead, according to the procedure in section X, paragraph 6, parts (a) through (j).

7. Plug the electrical connectors into the socket on the launcher.

XIII—DATA ON CRATING AND MARKING

1. The Bureau of Ordnance production motors (Mk 1 Mod 1) are shipped in the 11.75-inch Rocket Container Mk 1 Mod 0, which is a wooden container 88 1/16″ long, by 17″ wide, by 18⅝″ high, and holds one rocket motor. The California Institute of Technology production motors (Mk 1 Mod 0) are shipped in wooden crates, 93″ x 17½″ x 17″. The boxes are marked: "One 11.75-inch

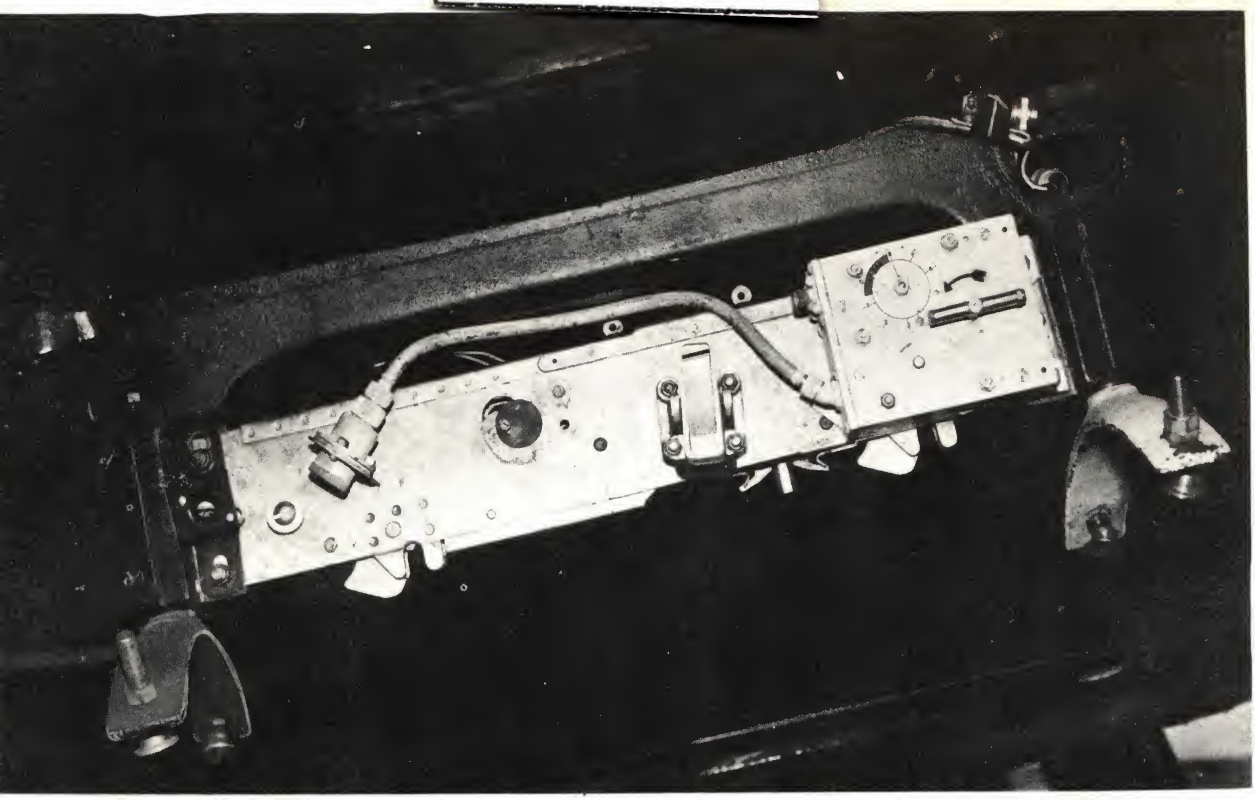


Figure 24—Lanyard Reel Switch Mounted on Bomb Rack on Starboard Side of F6F–5 Aircraft

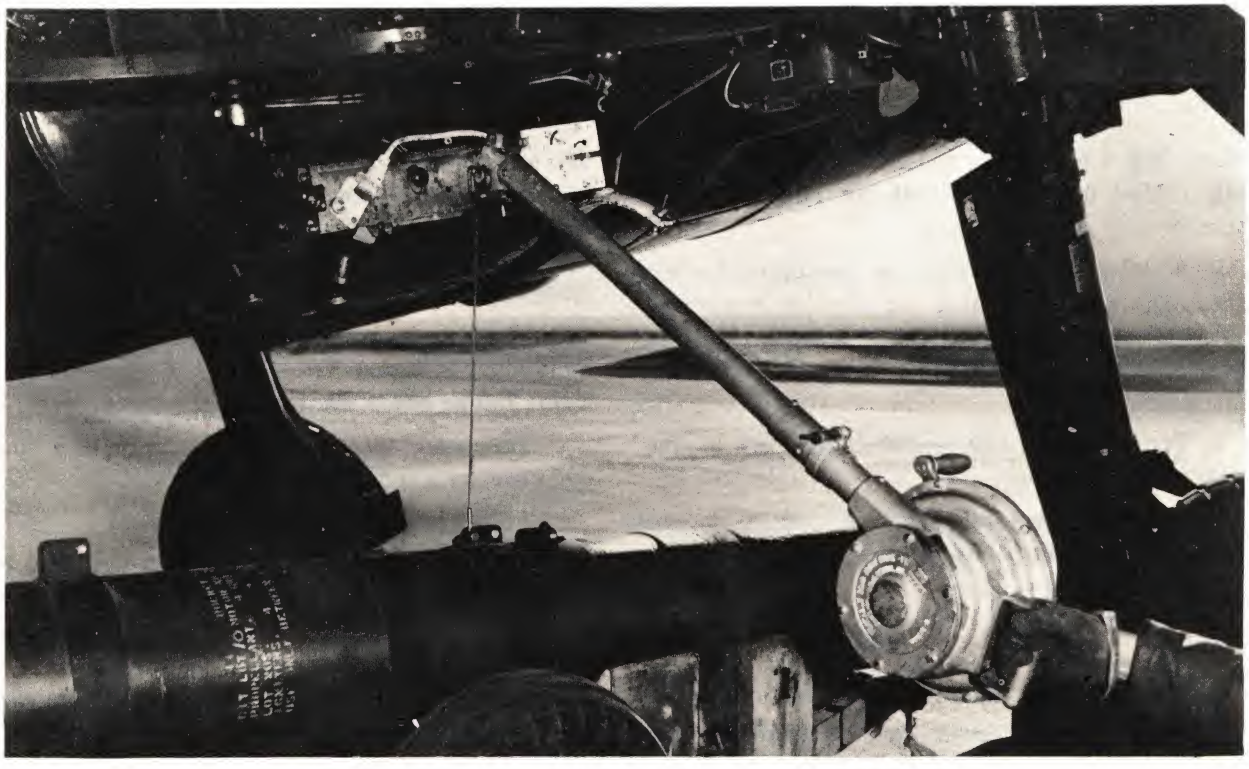


Figure 25—Hoisting Rocket onto Bomb Rack on F6F–5 Aircraft

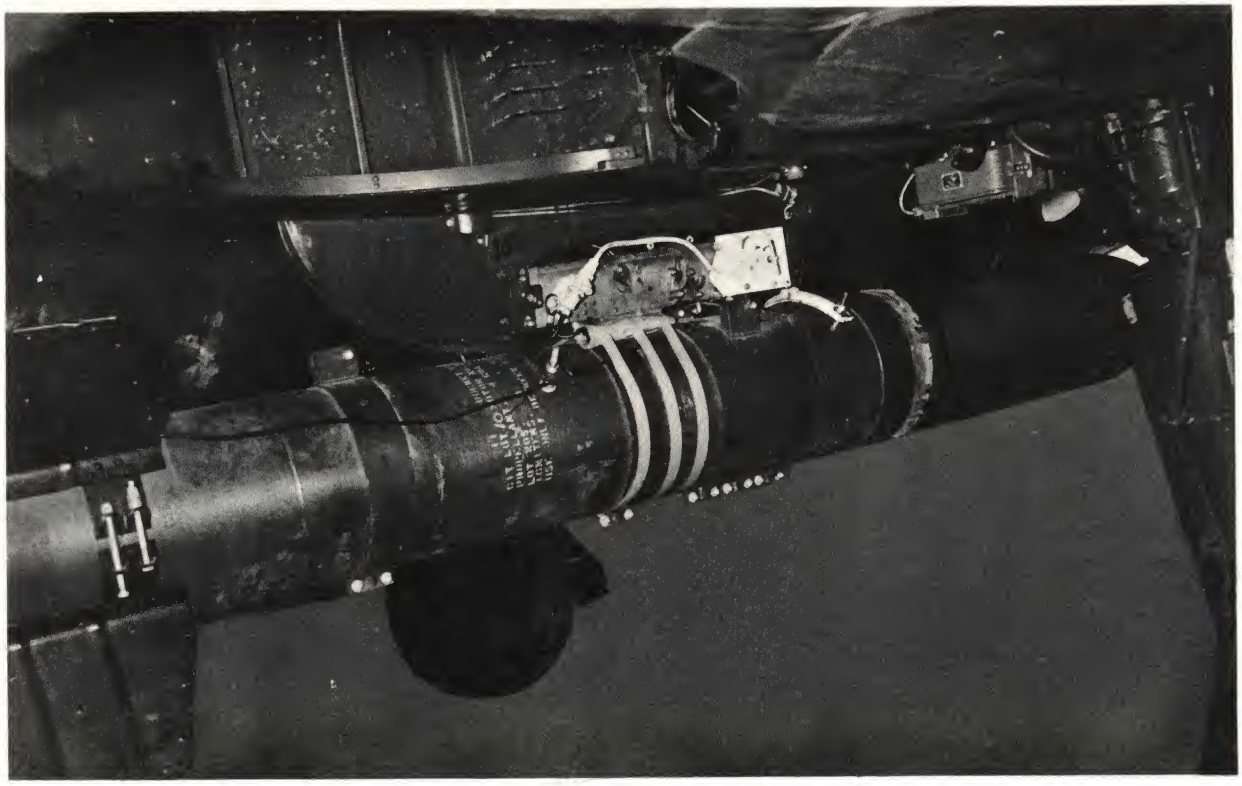


Figure 26—11.75-inch Aircraft Rocket Secured to Bomb Rack on F6F–5 Aircraft (Note that electrical connector does not pass over sway brace. An obsolete type of firing line is shown in this photograph. Also note lanyard installed, secured, and reel pointer near 6-foot mark).

Motor Mk 1 Mod 1" or "11.75-inch Rocket Motor Mk 1 Mod 0," together with lot number, motor number and gross weight.

2. A slot is being provided on the top of the box above the after launching lug band or removable hoisting band for the insertion of a special hoisting hook Carrier Mk 17 Mod 0, for ease in handling the boxed motors.

3. The electrical connector is shipped in the crate with the motor.

4. The assembled tail fins are shipped in the 11.75-inch Rocket Container Mk 2 Mod 0. The dimensions of this container are 23.3-inch x 23.4-inch x 24.1-inch. This is a steel fabricated container with a removable cover. The container is marked: "One Tail Assembly for 11.75-inch Rocket Motor Mark 1."

5. The heads are shipped uncrated, and are marked: "11.75-inch Rocket Body Loaded—cast TNT." The heads are loaded and fuzed.

6. The head, including the shipping cover and cuff, weighs approximately as follows:

Mark 1 Mod 1	607 lbs.
Mark 2 Mod 0	626 lbs.

XIV—STOWAGE OF COMPONENTS

1. In stowage, the motors and the bodies are not to be assembled, because in that condition the motor will be fully propulsive.

2. The motors may be removed from the wooden shipping containers for unboxed stowage, provided that the motor is protected as follows:

(a) Suitably supported at two points.

(b) Adequately secured against shifting.

(c) Not stacked barrel fashion or in any manner wherein the motors would rest upon each other.

(d) Stowed in a horizontal position.

(e) Given adequate protection to the electrical system so that no breaks or short circuits will result.

(f) Shielded sufficiently so that external fittings, such as lugs, lug bands, etc., may not be damaged.

(g) Guarded against deformation of metal parts so as to avoid dislocation or damage of propellant grain.

Otherwise, it is mandatory that the rocket motors be stowed in the wooden shipping containers in which they are issued.

3. The stowage requirements for smokeless powder are applicable to rocket motor stowage.

4. Rocket motors are not to be stowed in the same compartment with or near radio apparatus or antenna leads.

5. The heads should be stowed uncrated with the cuff and shipping cover in place to protect the external threads and the fuze. The same provisions that apply to the stowage of fuzed, TNT loaded projectiles (or bombs) also apply to the stowage of the rocket heads.

XV—COMBAT RADIUS

Tests have been conducted to determine the gasoline consumption and combat radius of the F4U–1D and F6F–5 aircraft, with results as outlined in the tables below. Though the values are only preliminary estimates, they are believed accurate to within about 5%.

F4U–1D

Flight	External Loading	Gross Wt. at Take Off *(Lb.)*	Combat Radius 20% Reserve *(Miles)*	Combat Radius 20% Int. Tank Reserve *(Miles)*	Remarks
1.	1—11.75-inch AR	13,468	228	228	
2.	1—11.75-inch AR 8— 5.0-inch HVAR	14,560	221	221	
3.	1—11.75-inch AR 1—Drop tank	14,578	344	476*	
4.	2—11.75-inch AR	14,761	183	183	
5.	1—11.75-inch AR 1—Drop tank 8— 5.0- inch HVAR	15,645	345	431*	
6.	2—11.75-inch AR 8— 5.0- inch HVAR	15,827	188	188	Heavy air up drafts throughout flight. Air cold, weather squally.
7.	2—11.75-inch AR 1—CL Drop tank	15,885	345	454*	

* Normally the fuel in the drop tank will take the plane to within a few miles of the target at any loading. Therefore, the reserve and gas used at the target must be taken out of the internal tanks, leaving the remainder for the return to base as the controlling factor in determining the radius that can be used. If the reserve is cut down to 20% of the internal tanks, instead of 22% of the total amount of gasoline carried at take off, the radius is increased proportionately.

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